NOTE II.

SUS-STUDIES IN THE LEYDEN MUSEUM

BY

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With 13 plates.

Several years ago I was informed by an old Resident from Palembang, Sumatra, that in that part of the large island was living a Pig, differing from all other described species and called *Nangoei* by the natives; the animal is not always to be found in that country but in certain months and then in large numbers, so that the natives can procure quantities by netting. In vain I tried to become specimens until the now Resident of Palembang presented me with the skull of a Pig, afterwards with two heads in spirits: all three were told to belong to what the natives call *Nangoei*. Unhappily the skull first mentioned is that of a not-adult specimen (6 molars in each jaw), moreover it is in a rather poor condition, as the upperparts have been smashed into pieces; and the extracted skulls of the now finely mounted heads show that they belong to still younger (5 molars in each jaw) specimens than the first skull; apparently these two heads however cannot belong to the same species; for meanwhile one of them has *the naked parts of the muzzle light colored*, the profile-line concave, the ears small, of an oval shape having the upper part of the inner margin nearly straight, very faintly concave with rather broadly rounded tip, outer margin slightly concave below the tip, for the rest broadly convex — has the other head *the muzzle dark colored,* the profile-line convex, the ears large, having the inner margin of a curved shape without concavity passing over in the rather sharply pointed tip, beneath the tip the outer margin deeply concave, then slightly curved towards the rounded off angle, from where the margin goes in a nearly straight line to the base of the earopening. The skulls present the same striking difference in the shape of the profile-line; moreover the small-eared specimen has a more elongated and in all parts more stoutly build skull, notwithstanding it belongs to a somewhat younger individual as the less development of the molars indicates. This small-eared, youngest but largest of the two specimens has the bony palate extended much more backwards, the anterior palatine foramina more elongate piriform, the distance between anterior incisors and end of intermaxillaria much larger, all the teeth are greater sized together with small differences in shape, nasalia more elongate and more slender, parietalia behind closer together than in the older large-eared specimen — distance of parietalia 17 mm. in the former (the youngest but largest) and 28 mm. in the latter (the oldest but smallest)!

In the lower jaw the distance between the articular condyle and the coronoid process is the smallest in the largest of the two. So there are several more or less important differences to be observed between these two skulls by close examination, differences very difficultly to describe in a few lines, very evident however by an experienced eye. By comparing the skulls with other ones of about the same size and development it grows evident that they both belong to female-specimens. As the large-eared, smallest but oldest of these two specimens shows the same characteristics in external appearance of the head as well as in the above mentioned characteristics of the skull as are peculiar to *Sus vittatus,* I do not hesitate to bring it under that head — so that one of the so-called *Nangoei-*

specimens turns out to be not a *Nangoei* at all! As however *Sus vittatus* is the sole well-known Pig-species living in Sumatra, there may be questioned to what species known from neighboring islands we must bring the other specimen just discussed?

Before entering deeper into this question, we have to return to the above mentioned skull without skin, the largest of the three specimens. This skull has six molars in each ramus of upper- and lower jaw and is a good deal larger than the just discussed younger skulls (basal length of cranium 29,5 cm. against 22 cm. and 20,7 cm.); it has the profile-line slightly concave like in one of the younger skulls — the *non-vittatus* one — and has in common with this skull all the above exhibited characteristics, as far as the smashed condition of the upperparts of the skull allows to judge of; distance of parietalia (later *crista*) 12 mm. This skull certainly is not that part of a *vittatus*-individual. Is it perhaps together with the above mentioned younger head and skull a true *Nangoei*? Which are the external features of the *Nangoei* and in what differ the bony parts of the *Nangoei* from the other known Pigs?

There has been described in the Proc. of the Biological Society of Washington, 1902, p. 51, a Pig from Sumatra, collected by Dr. Abbott on the Indragiri river; the describer, Mr. Gerrit S. Miller Jr., called it *Sus oi*, after the native name *Nang-oi* (as he spells it), evidently our *Nangoei*. In no other collection was a second specimen. Mr. Miller described it as: »an adult male, related to the Bornean "*Sus barbatus* Müller and *Sus longirostris* Nehring, externally most like *Sus barbatus*, skull essentially as in *Sus* "*longirostris*, teeth smaller than in *Sus longirostris* or *Sus* "*barbatus;* the skull so closely resembles that of an adult "male *Sus longirostris* from Borneo that it might readily "be supposed to belong to an individual of the same "species. Head as in *Sus barbatus,* except that about midway "between eye and muzzle there are *two well-developed pro-* "*tuberances* [1]), 30 mm. in length and 20 mm. in breadth, "densely covered with stiff antrorse bristles."

Mr. Miller repeatedly compares his species with *Sus longirostris*. But what is *longirostris*?

Professor Dr. A. Nehring was struck by *die langgestreckte schmale Form des ganzen Schnauzentheils* of a Pig-skull, collected with other Pig-skulls by Mr. Grabowsky in South-eastern Borneo; this skull had been said by Grabowsky to be a *Sus verrucosus*-skull; according to Prof. Nehring however it differs in so many points from that species, that he described it as belonging to a specimen of an undescribed species, which he called *Sus longirostris* (Zool. Anzeiger, 1885, p. 347). One will be surprised that Nehring did not compare the mentioned skull with another skull from Grabowsky's collection from the very locality; this skull with skeleton once belonged, according to Nehring (l. c. p. 347), to a *Sus barbatus*-specimen, the skull had the enormous size of 554 mm.! Why could Nehring's supposed new species not be a *Sus barbatus*? Had he compared these two skulls, *perhaps* many lines would not have been written and several papers had not been published! Grabowsky said that the Pig »dunkel behaart war, ähnlich "unserem europäischen Wildschweine und *zwei warzen-* "*ahnliche* [1]) Hautfalten im Gesicht hatte."

In Vol. II of the "Abhandl. und Ber. d. Kön. Zool. und Anthr.-Ethn. Museums zu Dresden", 1888/89, there is a paper by Dr. Nehring »Ueber *Sus celebensis* und Verwandte"; the author now paralleled his *longirostris*-skull with *barbatus*-skulls and it seems that he somewhat doubted of the specific value of his *longirostris*; we may conclude this from the following passus, p. 18: »Ob die Gründe, welche "mich zur Aufstellung dieser neuen Art veranlasst haben "auf die Dauer als stichhaltig erweisen werden, müssen "zukünftige Untersuchungen lehren. Herr Dr. Jentink, mit

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1) I italicize.

"dem ich über *Sus longirostris* mehrfach correspondirt habe, "äusserte in einem seiner Briefe die Meinung, dass der "von mir zuerst beschriebene Original-Schädel wohl nichts "weiter als derjenige eines sehr alten *S. barbatus* sei [1]). "Doch konnte ich mich von der Richtigkeit dieser Meinung "bisher nicht überzeugen. Ich gebe gern zu, dass die Gebiss- und Gaumenbildung stark an *S. barbatus* erinnert; "aber es sprechen doch viele Umstände gegen eine directe "Identificirung des *S. longirostris* mit *S. barbatus*." He furtheron discussed the differences between these two species and not more between *longirostris* and *verrucosus*, as this is out of question. Again Dr. Nehring in »Die Rassen des Schweines" repeated that his species — or more correctly the large Pig-skull — »ist in der Bildung des Gaumens "und der Eckzähne dem *Bartschwein sehr ähnlich* [2])", in this paper like in the foregoing the difficulty seems always to be, that Grabowsky told him »dass der Keiler dunkel "behaart war, und 2 *warzenähnliche Hautfalten* im Gesicht "hatte." In a paper »Ueber die Gaumenbildung von *Sus* "*barbatus* und Verwandten im Vergleich mit der von *Sus* "*verrucosus*" [3]), Dr. Nehring expressed himself still more positively as to the non-distinctness of *barbatus* and *longirostris*, at least he said: »dass *S. longirostris* mit *S. barbatus* nahe verwandt ist, habe ich in meinen bezüglichen "Publicationen mehrfach betont; vielleicht darf man in "ersterem nur eine *Varietät* des Bartschweins sehen." Nehring merely has to take a single step to agree with Spillner and with me in considering *Sus longirostris* and

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[1] Dr. Walter Volz shares my "Meinung"; he demonstrated in a paper „Zur Kenntniss der Suiden Sumatras", 1904, p. 534, that *Sus longirostris* Nehring = *Sus barbatus* Müller. According to him „Der einzige wirkliche "Unterschied zwischen den sumatranischen und borneensischen Thiere besteht "in der Ungleichheit von M, inf. Ueber diesen Punkt muss später noch mehr "klarheit kommen." As may be seen below, I however cannot agree with Dr. Volz in regarding Miller's *Sus oi* as identical with *barbatus*.

[2] I italicize.

[3] Sitzungs-Bericht der Gesellschaft naturforschender Freunde zu Berlin, 1895, p. 45.

Sus barbatus »völlig identisch." This step he has to take over the »*warzenähnliche Hautfalten*", which Grabowsky recollected having observed in the animal in question; now, *Hautfalten* hardly can be called *protuberances*, the more Grabowsky gave his informations from memory! I think it therefore consequent to cancel the specific-title *longirostris* until a skin with skull may prove that we are wrong in our conclusion.

There has been figured by Nehring (Die Rassen des Schweines, p. 20, fig. 4) a Pig-skull, from the Zool. Sammlung d. Landwirthsch. Hochschule in Berlin, as »Schädel eines männlichen Bartschweines aus Borneo, $^1/_5$ nat. Gr." It measures 562 mm. It therefore is a good deal larger than the largest known *barbatus*-skull; moreover if compared with a true *barbatus*-skull, f. i. with Nehring's figure of *longirostris* = *barbatus* on p. 22, there are such great differences in the shape that it is very apparently that Nehring has here figured a skull certainly not belonging to *barbatus* nor to another known species. It is perhaps a skull of an unknown very large Borneo-pig? As Nehring took this large skull as that of a *barbatus*-specimen, it is evident and explicable why he was forced to describe his true *barbatus*-skull as a new species, *longirostris!*

As there is in the Leyden Museum a rather large collection of Pig-skulls from the Malayan Archipelago and as these bony parts never have been thoroughly studied, and therefore not always bestowed with the correct specific title, I have reviewed our collection by the broad light that we owe to the investigations by Nehring, Spillner, Forsyth Major, von Nathusius, Rütimeyer and others. This study finally will throw much light over the question whether *Sus oi*, our *Nangoei*, may be admitted as a good species.

The following study will interest Zoologists the more as the type-specimens of *barbatus*, *verrucosus*, *vittatus* and *celebensis* are in our collection, having been described by

Schlegel and Müller in the monograph on the wild Pigs from the Malayan Archipelago, which forms a part of the bulky book »Verhandelingen over de natuurlijke Geschiedenis der Nederlandsche overzeesche bezittingen door de leden der natuurkundige commissie in Indië en andere schrijvers, uitgegeven op last van den koning door C. J. Temminck, 1839--1844". This splendid book has been written in dutch and therefore, although the book is well-known to all scientific workers, it mostly has been misunderstood, as I often exhibited in my different papers [1]) on the Malayan Mammals. Therefore I intend, if required, to give brief translations of the dutch descriptions of the external parts of the type-specimens, the bony parts being more transiently mentioned by the named authors.

1. *Sus barbatus* S. Müller.

The *type-specimen* is an *adult female* with its young, one of a litter of four; they have been killed in the neighborhood of the village Poeloe-lampej, not off the bank of the Moloekko-river, South-eastern Borneo. This adult female has been described and figured as having a large extraordinarily elongated and narrow head, very long undulating bristles on the cheeks, small ears, and the tail ending in a big tuft. Besides these characters and its size the species is very remarkable, wrote S. Müller, by the diversity in color of the specimens, some ones being nearly brownish yellow throughout, others about blackish, in proportion to the prevailing yellowish or blackish hairs.

This *adult female*-specimen, figured in the »Verhandelingen", Tab. 30, fig. 1, and previously described in »Tijdschrift voor Natuurlijke geschiedenis en Physiologie", 1838—1839, p. 149, has after Müller *the nose of a brownish flesh color*; the animal may be described after the stuffed type-specimen as follows: anterior part of muzzle bald, on its middle a rather broad cross-band of black stiff hairs,

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1) In „the Notes from the Leyden Museum".

broader towards the sides of the upperlip; for the rest the head is adorned with a mixtum of reddish brown, black or black-tipped reddish brown thickened bristles, especially of extraordinary thickness and very elongated and curled on the cheeks, short on the forehead, forming on both sides of posterior part of muzzle a tuft of stiff elongated bristly hairs, another party of such although shorter hairs is to be found anterior to each eye (lachrymal gland) [1]), middle of back with rather elongated reddish brown hairs, these hairs grow shorter towards the base of the tail and the sides of the body, they are on the latter parts intermixed with black tipped hairs, meanwhile most of the hairs on the sides and extremities are black throughout; the thick tuft of the tail is black also. This tail-tuft is quite unlike from all other tail-endings in the large Pig-species, it reminds the tail-tuft of some *Colobus*-species. The very developed beard and this peculiar tail-tuft combined with the small oval ears and flesh-colored nose [2]) characterize this species.

The skull has been figured in the »Verhandelingen", Tab. 31, figs. 4 and 5; it belongs to a complete skeleton. It is very elongated and surprisingly small across the zygomatics; the malar and maxilla bones describe a sloping line from behind towards the infraorbital foramen, so that the skull makes a very slender and elegant impression; upperpart of skull slightly concave by an impression of the frontals; the parietals form a beginning crest of 12 mm.; the bony palate extends far beyond the last molar (45 mm.), ending in a deep sharply pointed V. The elegant shape, together with the very elongate bony palate, characterizes the skull of this species,

A *male*, from the same part of South-eastern Borneo

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[1]) These bristles cannot be compared with the large warts or protuberances of *Sus verrucosus*, as they merely erect directly from the skin, without a trace of wartlike base; moreover they do not occupy the same parts on the head in the two species.

[2]) Evident in fresh specimens, not or badly to observe in dried skins.

(Banjermassin) as the above described type-specimen of *Sus barbatus*, has been procured by Dr. Schwaner for our collections; it is a stuffed specimen with its skull. The less developed molars and the smaller beginning crista (22 mm.) show that, although fullgrown, it is a younger individual than the above described female-specimen. It presents the above mentioned characteristics, viz. the very developed beard, the peculiar thick tail-tuft, the small oval ears, the elegant shape of the skull and the very elongate bony palate, so that there is no reason to doubt its absolute identity with *Sus barbatus*. The animal is darker colored, however this may be because it is a male or it may prove true the statement of Dr. S. Müller that the specimens vary in color, from brownish yellow to blackish, in proportion to the prevailing yellowish or blackish hairs. It has the ornamental tufts on the posterior part of the nose and the hairy border round the lachrymal glands, as well as the elongated curled beard on the cheeks of the above described female-specimen; however the hairs or stiff bristles are mostly black so that the animal looks quite black in stead of reddish brown. The skull is a trifle smaller, as the animal is somewhat younger as I observed above, meanwhile the impression of the frontals is somewhat deeper and the canines stronger developed. In our collection is an other skull from the same collection, made by Dr. Schwaner in Banjermassin; it is the skull of a very old male, with extraordinarily used molars so that the anterior premolars in both jaws have vanished, with a still deeper impression of the frontals than in the just now mentioned younger male-skull; the slenderness however of the skull and the very great extent of the bony palate is highly striking. The crest formed by the parietals is not more than 10 mm. wide, so that we may conclude — taking in consideration that in the very old male-skull there is not yet a good developed crista — that at all events in *Sus barbatus* a complete crista never occurs, perhaps only in extremely old individuals.

The *young female*, figured in the "Verhandelingen", Tab. 30, fig. 2, presents the following features: on the head and middle of the back the reddish brown color predominates, especially on the latter part where the hairs are longer and more or less crest-like; muzzle and forehead with black hairs; cheeks with beginning beard; tufts upon nose hardly perceptible, the lachrymal glands however encircled by although still short but reddish brown hairs. Ears as those of its mother; head very elongate; tail-tuft in a poor condition. Sides of body with a mixture of black and reddish brown hairs; extremities black haired. Skull — five of the seven molars present — slender and elegant, bony palate largely extended behind; distance of parietals 23 mm.

A couple of still younger specimens, collected by Diard near Pontianak, Borneo, belong apparently to *Sus barbatus*; they are very young, the skull of one of them presents only three molars. They have the typical, oval ears, the elongated muzzle, the slender skull and the largely developed bony palate, so that notwithstanding their origin from the widely distant locality Pontianak, we may be sure of their specific identity with *Sus barbatus*. These individuals are especially interesting as they can make out the question whether the young ones are striped or not; and they are very obviously striped; the sides of the body present some rather broad stripes or bands of brownish red hairs, four more or less complete bands run on each side of the body parallel to the spine. Very important is that the spots on the muzzle, where later on the tufts grow up, are indicated by two small tufts of erected black hairs, easily overlooked by an observer unknown with the presence of these ornaments in the adult specimens.

There is in our collection a Pig-skull, presented by Dr. Semmelink in 1866 from Palai-ari or Pleihari, southerly from Banjermassin; it belonged evidently to a half-grown male-specimen — five molars are present and the canines rather strongly developed; distance between parietals 24 mm.; it without doubt is a *Sus barbatus*-skull as its slender and elegant shape indicates, moreover the bony palate is very large backward; the slightly impressed frontals are another proof of its being a male-skull, as this impression is still less visible in female-skulls of much larger size.

A character in common with all the skulls of Sus barbatus, adults as well as young ones is that the premaxilla ends not abruptly anterior of the incisors — as in most other Pig-species — but this bone extends for several millimeters forward; the north Celebian-Pig, *Sus celebensis*, shows this very character.

The skeleton of the type-female above described presents 14 dorsals with 14 ribs, 5 lumbars, 3 sacrals and 18 caudals. The ribs are *very broad*; compared with the ribs of *Sus verrucosus* and *Sus Milleri* they are *about double as broad* as those of the latter two species; they agree herein with *Sus cristatus*, the for the rest so very different Pig of the Indian Continent. The ribs of *Babyrussa alfurus* are very broad also, but at the same time very thick so that they appear oval by transverse section, the ribs of *Sus barbatus* however are flat.

A table of measurements of skulls and teeth, side by side with the same of the other *Sus*-species, is to be found at the end of this paper.

Besides the above discussed material from Borneo, we possess two skulls (see under *verrucosus*) from Java, collected by Diard; I fail to find differences between these skulls and the other true *barbatus*-skull; the mere difference is perhaps their extreme developed parietal crest. It therefore must be accepted that *barbatus* is living in Borneo, Java and, if we may trust other naturalists, also in Sumatra; perhaps individuals from the latter locality belong to the following species.

2. *Sus oi* Miller.

The foregoing pages already since several months had been written and I throughout was convinced that *Sus oi* was a good species, as I received a letter from Sumatra announcing that a couple, male and female, had been procured and were at my disposal. I thought it wise to remove the publication of this paper to the time when I should have the individuals before me, so that I could give a description of the animal, adult and young, male and female, with the bony parts in the different stages of development. And now I have at my disposal the following material of *Sus oi:* the skull of a specimen with six molars, a skin with skull of a younger specimen with five molars, a skull of a still younger individual with five molars, besides the head belonging to that skull, an adult female with her young (a male); the latter two specimens are at present *living* in the Rotterdam-Zoological Garden, being kindly presented to the Leyden Museum by Mr. v. Rijn v. Alkemade, Resident at Palembang. This living female measures along the spine from between the ears to the base of the tail 107 cm., height at the haunches 72 cm., at the middle of back 78 cm., and at the shoulders 74 cm.; comparing with Miller's measurements we see that his typical male-specimen is a good deal larger than our adult female. The young specimen, although only some months old, has attained about the size of its mother. I therefore suggest that the male attains, if fullgrown, a larger size than the female. I happily could now study the animals from the life and can give a better description than when studied from the most exactly mounted specimens, moreover we have the great adventage to give photo's from the life. *Sus oi* makes indeed a very strange impression, quite different from all other Pigs. This remarkable animal has its flanks much flatter than other pigs have, so that the body is very oval in section; at the base of the tail there is a rather deep fold in the skin, therefore it makes the impression as if the tail has been pushed into the body, so as we find it sometimes in badly mounted mammals; the tail is very flat, compressed; along its upper and under margin there is a row of standing stiff black hairs, growing longer towards the tip of the tail (plate 5, fig. 1). The skin of the body shows a beautiful flesh-color, the hairs on it are scantily planted, each hair is black with a whitish long backward curved tip. The most strikes however the peculiar shape and ornament of the head (plate 3); meanwhile the distance between the ears is not more than 9,5 cm., and that from ear to eye 7,5 cm., the distance between eye and end of muzzle is not less than 31 cm.; the feebly impressed enormous profile-line is therefore of an extraordinary length and ends rather abruptly in the very broad and large flesh-colored front of the muzzle, as it were in a broad fleshy disk; the part of the muzzle adjoining this disk is destitute of hairs; follows a broad band of short black stiff hairs; from there till nearly to the eyes there is a mass of curled very elongated whitish bristly hairs, covering two well-developed protuberances and on the sides of the cheeks forming a large wild beard, a good deal stronger developed than in *Sus barbatus*. Ears smaller than in other pigs and of an oval shape. I fail to detect essential differences between our two living animals, merely that in the younger male the hairs on the back seem to be somewhat larger and more numerous and that of course the whitish beard is less developed.

Our younger skin has the head not so hairy, that is to say the hairs generally are shorter although the elongated cheek-beard is rather good developed; the protuberances are in loco, they however bear short whitish yellow bristles; distance between ear and eye 5 cm., between eye and end of the muzzle 20 cm.; a kind of mane of elongated flexible bristles from between the ears along the spine, these bristles are for the greatest part whitish yellow from base to tip, others black to the base have very long whitish yellow tips, and among them are several entirely black bristles.

I regret it very much that it at present is an impossibility to enter into osteological details because it might be called somewhat barbarous to kill the two so interesting animals for that purpose; later on therefore I hope to be able to describe the skeletons of adult female and male, together with their skulls. Happily we have some measurements of the typical male-skull, described by Mr. Miller; the latter was kind enough to present me with some photo's of the skull, meanwhile Mr. S. P. Langley of the National Museum, Washington, had the extreme kindness to allow me to publish these photo's if desired; to both gentlemen I express here my sincere thanks. Previously I must confine myself to the following observations made on the not-fullgrown skulls in our collection mentioned above. As might be expected from such a remarkably elongated head the skull indeed is proportionally narrower and longer than in any other Pig-species, all the bones are as it were stretched, the nasalia are much narrower than in *barbatus* and more elongated, so that the skull makes a still more elegant impression than in that species; the premaxilla bones surpass the anterior border of the upper incisor much more than in *barbatus*, in our skull with six molars for about 9 mm., in the same skull the beginning crista measures not more than 12 mm. and the width between the zygomatic arches is only 118 mm. Like Miller observed the skull so closely resembles that of *Sus longirostris* (our *barbatus*) that it might readily be supposed to belong to an individual of the same species. Although, as we remarked above, there are several striking differences between the two species, we may call *Sus oi* the representant in Sumatra of *Sus barbatus*.

3. *Sus verrucosus* S. Müller.

The type-specimen, an *adult male*, described and figured in the »Verhandelingen", p. 175 and Tab. 28, has been bestowed with the very appropriate title *verrucosus* after its having the head adorned with a number of protuberances or large warts; there is a large protuberance above each upper canine, another still larger one under each eye, finally a very large one at a certain distance under each ear; they are decorated with stiff bristles, rather short on the two first mentioned, but very long and thick and upward curled bristles cover the protuberances under the ears; the latter kind of bristles forming a kind of small beard from below these tuberances to the corner of the mouth. Three folds of the skin indicate the openings of the lachrymal gland. From between the ears a broad crest of very thick elongated and widely apart implanted bristles runs along the spine, these bristles growing shorter and shorter towards the base of the tail. Ears much larger than in *Sus barbatus* and broader, not so regularly rounded off and so nicely oval shaped as in *Sus barbatus*; in the latter the ear-conch begins directly close to the skin, meanwhile in *Sus verrucosus* the ear forms a closed cylinder to a certain distance from the skin and afterward the broadened ear-conch follows. The tail is about as long as that organ in *Sus barbatus*; it however does not end in a tuft or brush but in a few pendant bristles.

All the bristles of head, upperparts and sides of body and extremities are black, except a band between the warts on the sides of the nose, another band between the base of the ears on the forehead, the hindmost bristles on the warts beneath the ears, a few bristles between the nose-warts and the warts under the eyes, some bristles in the crest and others sparingly scattered among the bristles of the body — all the named bristles are reddish brown colored; the belly and chest are clad with uniformly reddish brown bristles; inside of ears with similar hairs. Nose and lips of a dirty flesh-color; eyelids and hoofs black. The six so prominent face-warts or protuberances distinguish this species among all other Pigs.

In our adult *female*-specimens the distribution of colors is about the same as in the above-described male; there is however a difference in the warts, these parts namely are all of much smaller size than in the male; in a half-grown specimen they are hardly perceptible, meanwhile the *very young* specimens do not present a trace of them;

the latter however are characterized by having *no bands or stripes at all on the body*, in which characteristic they differ from all the other hitherto known Pigs from the islands of the East-Indian Archipelago. Dr. Forsyth Major (Ann. and Mag. N. H. 1897, p. 531) said that he expected that the "wart" supported by the crest and the nasal rugosities of *verrucosus* will be found to be missing in females and young individuals of the *verrucosus*-group. Evidently he never had seen a female-specimen at the time he wrote his paper »on *Sus verrucosus* Müll. and Schleg., and allies, from the Eastern Archipelago".

In the »Verhandelingen a. s. o., Tab. 32, figs. 1, 2, 3 and 4, there have been figured two skulls as skulls of *Sus verrucosus*; 1 and 2 represent a very elongate skull, labelled as having been collected by Diard in Java, slender in shape, with a well-developed crista, meanwhile 3 and 4 are figures of a much shorter skull, broader and not elegant, sides of future crista widely apart. Do these two skulls really belong to the same species? Apparently Müller and Schlegel have been struck also by the different shape of these skulls, for which these authors gave the following interpretation, l. c. p. 176: »the skull (of *Sus verrucosus*), "especially in very adult specimens, is much more oblong "than in *Sus vittatus*. The orbits are smaller; the jugal "bones stouter and more outward curved; the excavation "on the sides of the skull, wherein the muscles of the "snout are fixed, is more oblong and deeper; and the skull, "especially in old specimens, is more or less impressed "above opposite the posterior part of the named excavations. "Finally is the distance between canine and molars much "larger than in *Sus vittatus*. The metamorphosis by age "in the shape of the skull of this species (*Sus verrucosus*) "is very great, caused by the oblong form growing with "advanced old age. One may understand these metamor-"phoses by comparing our figures of both skulls, of a "tolerably old (Tab. 32, figs. 3 and 4) and a very adult "skull (Tab. 32, figs. 1 and 2). Moreover in this species, like "in all the other species there are so many individual "differences in the shape of the skull, that nay in a series "of about twenty skulls it may be called a difficult task "to find out two skulls exactly agreeing in all details; it "therefore is very difficult to describe other characteristics "as the above exhibited." In other words: Schlegel and Müller considered the short and broad skull to be a not so adult form of the same species as the elongated and slender skull, an opinion accepted in my "Catalogue ostéologique, 1887" and persevered in my first correspondence with Prof. Nehring, who had ventilated the idea that this elongated skull merely was a skull of his *Sus longirostris*; later on I studied the questioned skull closer and wrote to Prof. Nehring that I was convinced that the skull was a very old *Sus barbatus*-skull, and that therefore in my view Nehring's *longirostris* was merely a very old *Sus barbatus*. Besides this skull we possess an other still older one, with more used molars, agreeing in shape entirely with the mentioned elongated elegant skull, figured by Müller and Schlegel, presenting the elevated crest as well as the other characteristics; both skulls present the posteriorly extended bony palate together with the above described characteristics of *Sus barbatus*; both skulls have been collected by Diard in Java. The differences between the skulls of *barbatus* and *verrucosus* indeed are very radical, as will be seen from the following description of our skulls of the latter species.

Skull of *Sus verrucosus*, figured in the »Verhandelingen", Tab. 32, figs. 3 and 4. The total impression is that the skull is short, compact and broad; malar bones very thick and broad, inflate; lacrymal strongly developed; the latter forms with the posterior part of the maxilla a deep hole, separated from an other deep concavity by the sharp crista of the maxilla; this crista ends rather abruptly compared with the maxillar-crista in the *Sus barbatus* skull, which runs sloping towards the infraorbital foramen; *meanwhile in all the other species there is on each maxilla a single* *foramen infraorbitale, Sus verrucosus is distingnished by having constantly on each maxilla two foramina infraorbitalia*, a remarkable peculiarity till now however overlooked as far as I am aware. The above described shape of malar, lacrymal and maxilla give that part of the skull a much broader appearance, very much less elegant compared with *Sus barbatus*. The premaxilla bones stop close to the upper incisors; these bones on the whole are much shorter than in *barbatus* and therefore essentially contribute to the shortness of the skull. The bony palate extends posteriorly perhaps still more backwards than in *S. barbatus*, notwithstanding it makes the impression of being a good deal shorter; this however really is not so, but a result of a removing backwards of the whole molar-series, so that in *verrucosus* the hind-most upper molar is situated exactly under the two infraorbital foramina (in *barbatus* the anterior molar is to be found under the infraorbital foramen) and the posterior margin of the last molar lies in *verrucosus* in a line with the anterior margin of the bony eye-hole and about *one* centimeter in a straight line under the posterior bow of the bony palate (in *barbatus* the posterior margin of the hindmost molar lies a good deal anterior of the bony eye-hole, meanwhile the distance between that hindmolar and the end of the bony palate measured in a straight line amounts to about *five* centimeters).

A comparative study of the skulls of *barbatus* and *verrucosus* learns that practically there are no corresponding bones of the same size or shape in the two species, so that the differences may be called infinite. Very conspicuous is the nearly straight profile line, nay in adult skulls, the enormously developed horns of the palatine-bone and the small bony eye-holes in *verrucosus*, and the widely separated rami of the lower jaw in *barbatus*.

The most interesting is the *very large last molar*, especially the last molar in the lower jaw of *verrucosus*; it measures in the figured and here described skull not less than 45 cm., in the upper jaw 40 cm., and that notwithstanding these molars are not at all used so that the skull is not a very adult one, as indeed the distance between the parietals behind (beginning crista) may demonstrate, this distance being 45 cm. (in the very old skull of *barbatus*, figured by Müller and Schlegel as *verrucosus*, with a well developed crista. and very used molars, these measurements are 40 cm. lower jaw and 37 cm. upper jaw).

For the shape of the lower canines in *Sus verrucosus* and *Sus barbatus* I refer to a paper published by Dr. C. J. Forsyth Major in the Annals and Mag. of Nat. Hist. 1897, p. 521. — In that very paper, p. 523, that author says: »in some Middle Tertiary members of *Sus* no difference "is to be found between the two sexes in the size or shape "of the tusks; both have their lower canines of moderate "size and width, the outer and inner side being of equal "breadth, a. s. o." I cannot understand this sentense; I should like to ask: how Dr. Forsyth Major knows that a fossil *Sus*-skull belonged once to a male or to a female specimen, if, as he stated, there is no difference in the size and shape of the tusks?

In the lower jaw of the skull of *Sus verrucosus*, figured plate 6, there is to be seen a very interesting abnormity; nml. instead of the third left lower premolar, there are three normally developed ones, two of them parallel to one another and to the ramus of the jaw, the third however is planted square before the other two; these three premolars are in one and the same alveole.

From the foregoing discussion it is evident that *b* and *c* under the heading of *Sus verrucosus*, exhibited in my »catalogue ostéologique", as belonging really to *Sus barbatus*, have to been removed under the latter heading. One of these skulls has been figured in the »Verhandelingen" and has been regarded by Dr. Nehring as a specimen of his *Sus longirostris*, now as *b* and *c* are skulls of *barbatus* as I demonstrated, it follows that *Sus longirostris* is merely a synonyme of *S. barbatus*; Nehring's *longirostris* therefore has to been cancelled. It may perhaps been allowed to observe that according to Dr. Dybowsky — as Dr. Nehring wrote — his specimens showed »zwei warzenähnliche Hautfalten im Gesicht", now *barbatus* practically has two pairs of *tufts* of stiff elongated bristly hairs, which might be called perhaps »warzenähnliche Hautfalten"; but such *tufts* never can be compared with the enormously developed *warts* or *protuberances* on the face of *verrucosus.*

All our specimens are from Java and never has any naturalist procured a *verrucosus* from other islands; it is therefore very remarkable that according to Dr. Forsyth Major, l. c. p. 534, there is in the British Museum the skull of an old male from Borneo, collected by Mr. A. R. Wallace; he describes it as belonging to an individual of a new subspecies, *Sus verrucosus borneensis.* That is all what is known about the animal.

In the »Verhandelingen" has been described *Sus vittatus*, based upon specimens collected by the members of the »Natuurkundige commissie", in Sumatra and Java. Now in December 1904 Mr. Gerrit S. Miller Jr. from the Washington Museum was studying here during a fortnight; he suggested that the specimens described as *Sus vittatus* might turn out by close inspection to be a mixture of two distinct species, the one from Sumatra, the other from Java; and indeed by looking through our material it soon appeared that Miller was quite right in his suggestion. There are, as well in the skulls as in the external appearance, differences constant for the animals procured from each of the two islands. The figures of the animal as well as those of the skull evidently have been drawn by Prof. Schlegel under the impression of the specifical uniformity of the pigs of both localities, so that the description is appliable to both and as to a certain degree also the figures, therefore it now hardly can be made out what Schlegel's typical specimen really has been. Under these circumstances we had to solve the question by letting the old name to one of the species and give to the other a new name; after all a mere matter of convention; so Mr. Miller and I decided to call the Sumatra-species by the old name given by Müller and Schlegel, *Sus vittatus;* and I propose to give to the Java-species the name of my ingenious friend who first drew our attention to the specific distinctness of the two species, and therefore to baptize it *Sus Milleri.*

4. *Sus vittatus* S. Müller.

In a young state the animal is adorned with alternately black and reddish brown bands along the sides of the body; by advancing age these bands vanish so that in fullgrown individuals the body is of an uniform dark varied with reddish brown; the line along the spine however is black, with longer bristles towards the nape of the neck where they form a crest; these black bristles are broadly reddish tipped.

In fullgrown specimens there is a broad brownish red band over the middle of the snout, broadening over the sides of upper lip and corner of mouth, running over the lowerlip straight backwards ending in a point or rather vanishing on the lower parts of the neck. In very old individuals the described band is often very inconspicuous. All the other bristles on the head and those on the body are black with a subapical reddish brown ring, giving the animal a much more reddish tinge than the individuals of *Milleri,* the Java-species; the bristles on the middle of the back have reddish brown tips, without doubt because the black tips have been scoured off against the low shrubs they meet in their footh-ways. No warts, protuberances or tufts of bristles like on the head of *barbatus* and *verrucosus.* Ears in size between these species, ending in a well developed somewhat outwards turned tip. The head is shorter than in the named species and the profile-line is slightly curved, in fullgrown specimens straight, in very adult ones feebly curved. Tail ends in some elongated bristles forming a flat small tuft. Müller described nose and lips as being dirty flesh colored, eye-lids and hoofs black.

Although the skull may be said to merit to be placed between *barbatus* and *verrucosus* with regard to its slenderness it in reality is of a much more compact shape and higher in proportion to its length; this highness results from the very high lower jaw, meanwhile its shortness is caused by the shorter jaws, the anterior upper premolar being placed near to the canine and the distance between first and second lower premolar being a very short one, and the like the distance between canine and hindest lower incisor being a good deal shorter than in *barbatus* and *verrucosus*; like in *barbatus* the premaxilla surpasses the anterior border of the upper-incisors; the upper molar series is like in *verrucosus* pushed backwards, but the bony palate does not extend so far backwards as in that species; the hind-most molars though nearly as broad are much shorter than in *verrucosus.*

The profile-line is convexe, in very adult skulls straight or very feebly impressed on the posterior parts of the nasalia; the eye-hole is larger than in *verrucosus*, the malar deeply excavated; in *vittatus* as in *verrucosus* the parietals never seem to meet so closely behind as to form a crista like in very adult *barbatus*, and that notwithstanding I have before me skulls of the two species with very used molars and where the sutures between parietals and frontals entirely have vanished.

Sus vittatus for the rest seems to be a very strong animal, armed with enormously developed canines; indeed Dr. Hagen relates specimens of its boldness (cf. Tijdschrift van het Kon. Nederl. Aardrijksk. Genootschap, 1890).

Sus vittatus is living in Sumatra.

5. *Sus Milleri*, n. sp.

Very young specimens are broadly banded like in *vittatus*; a nearer inspection shows that the anterior part of the yellowish red bands ends in a large spot, an other ditto spot is between the uppermost and second band, meanwhile there are several large and small spots on the buttocks; in a later state these spots meet to form true bands; in fullgrown specimens the general hue is a yellowish brown, a much lighter color than in *vittatus*. There is like in *vittatus* a light colored band over the nose and on the cheeks, in *Milleri* however the color is a yellowish brown. For the rest all the bristles on the body are shorter than in *vittatus* and appearantly wider apart planted, meanwhile each bristle has a yellowish brown colored subapical ring. Ears and tail like in *vittatus*, as far we can judge after dried skins. No warts, protuberances or tufts of bristles like on the head of *barbatus*- and *verrucosus*-specimens.

The head makes a duller impression than that of *vittatus*, originating from being broader between the ears and shorter than in that species; consequently the skull is shorter than in *vittatus*. There is moreover a very constant character in the distance between the frontal and premaxilla bones along the sides of the nasalia being much greater constantly than in *vittatus*. The nasalia are much shorter than in *vittatus*, nay in the skull generally is a striking tendency towards shortness, so that f. i. in a very adult skull the anterior upper premolar is as it were pushed away from its alveole and often is replaced by the second upper premolar very closely set to the canine. For the rest I fail to see differences in the dentition between this and the foregoing species, nor in the extension of the bony palate posteriorly. The premaxilla-bones are less extended foreward than in *vittatus*.

Skeleton with 14 dorsales and 14 ribbs, 5 lumbares and more than 20 sacrales and caudales taken together (the end of the tail is wanting); the form of the ribbs much more remembers these parts in *verrucosus* than in *barbatus*, the anterior ones are thick but narrow, meanwhile the posterior ones are broader, however less flat than and not so broad as they are in *barbatus*.

Sus Milleri is an inhabitant of Java.

»Probably *Sus vittatus* inhabits all the islands westward Sumatra" wrote von Rosenberg (der Malayische Archipel) and also Banka (after S. Müller, Verhandelingen). Max Weber (Zoologische Ergebnisse, 1890) wrote concerning Flores as locality for this species: »in Flores is also a "species of wild hog. I got only the right mandibular "tusk of a male, that agrees most with the tusk of *Sus* "*vittatus* not at all with that of *S. celebensis.*" Afterwards Prof. Weber procured four skulls from Flores, Maumeri; these skulls are now before me; they have been labeled *Sus vittatus* Müller var: — Prof. Weber (Zool. Ergebnisse, Vol. III, p. 267) expressed himself as follows: »ich erhielt "durch die Güte des Herrn Calon vier Schädel erwachsener "Thiere von denen aber auch der älteste, zweifellos männliche, "kleinere Hauer hat als der isolirt vorliegende ursprüng-"liche. Diese vier, unzweifelhaft von Flores stammenden "Schädel gehören nun einer kleinen Rasse an, die offenbar "*Sus vittatus* unterzuordnen ist. Ob sie ganz rein geblieben "ist von Vermischung mit domesticirten Schweinen, wage "ich nicht zu entscheiden." Three of these skulls apparently once belonged to females, the fourth one evidently is the skull of a very adult male. That Prof. Weber labeled them *vittatus* var: was quite right, indeed they make the impression as belonging to a miniature edition of *vittatus*. A closer inspection however much modifies that determination, at all events a previous one. The skulls differ so widely from all other hitherto described ones, that although I hate it to describe as a distinct species an animal of which only the skull is known, I think the separation of the mentioned skulls under a distinct specific title may be called well founded. So I propose to call it

6. *Sus floresianus* n. sp.

External characters unknown.

The exceedingly thick-bony, short, broad, massive and compact skull suggests as it were unvoluntary that the animal ought to be a very strong build brute; I never before saw a skull like the adult male-skull now to describe. Although the profile-line measures only 260 mm. and is therefore a good deal shorter than the same in *vittatus* (330 mm.) the skull is of the same broadness measured over the zygomatic arches, so that it makes a still less elegant impression than a *vittatus*-skull; the nasal bones end much more backwards than in *vittatus*, viz. in a line with the suture that separates the maxilla from the malar, the nasals are much broader than in any other species; parietals meet not to form a crest behind (distance 26 mm.); the great infraorbital foramen above the fourth upper premolar like in *vittatus; just anterior to this foramen there is a strongly developed bony protuberance on the maxilla*, as far as I am aware unknown in other skulls; premaxilla ends abruptly anterior of the incisors; bony palate ends like in *vittatus* at short distance behind the last molar, but is much broader and the anterior palatine foramina are much less elongated than in *vittatus*; molar series shorter than in *vittatus* in accordance with the smaller size of the skull; the anterior premolar not in the teethrow,, in the old skull this tooth has been pushed away and the second premolar occupies its place in the teethrow, however out of the square. *In the lower jaw there is aside the second molar an enormously broad and high bony protuberance*, unlike anything known in other skulls; canines very large and strong, at least as stoutly developed as in *vittatus*. The figure of this adult male-skull may give further details. The female-skulls materially do not differ from it in the main points, except that the two pairs of remarkable protuberances are totally absent, solely in the lower jaw there is a feeble swelling of the bone like in *celebensis*. One of these three skulls is that of a very adult female, so used are the molars that the four canines are mere stumps, in the upper jaw all the molars are absent — the alveoli being entirely vanished by growing — with the exception of the two hindmost molars on both sides, however totally weared out, in the lower jaw the two hindmost molars are present on both sides, further in the right ramus the anterior premolar and in the left ramus the anterior and the fourth premolar, besides the anterior molar, weared out however as in the upper jaw — and yet no crista is formed by the parietals (distance 24 mm.)!

Professor Max Weber was kind enough to allow me to describe this species and to study all the other Pig-skulls brought together by him during his voyages in the East-Indian-Archipelago; my sincere thanks to him!

7. *Sus timoriensis* S. Müller.

Although the adult form of this species is at present unknown — the type-specimens too being semi-adult or young ones — its specific value is beyond doubt. It may be called a dwarf under its fellowpigs, for in the type-skull the distance between the parietalia behind (later crest) is not more than 9 mm. and that notwithstanding solely the hindmost molar in both jaws is not yet developed, although clearly visible, so that we may safely conclude that the skull has attained its full size; the greatest length of the skull is hardly 230 mm. (this skull has been figured in the »Verhandelingen", Tab. 31, figs. 2 and 3), meanwhile in a specimen of *vittatus* of about the same stage of growth this measure is 328 mm. and the distance between the parietalia 35 mm. I have here compared the Timor-skull with a *vittatus* because the original describers have ventilated the supposition that the Timor-pig was in all directions very closely allied to *Sus vittatus* — »in alle opzichten zeer nauw verwant aan *vittatus*" — and as I venture to hold up another opinion. It is quite right that the skull has the slender and elegant aspect of *barbatus* and *vittatus* and that the bony palate is not far pushed backward like in *verrucosus*, however in *vittatus* like in *barbatus* the premaxilla surpasses the anterior border of the upper incisors, but *not* in *timoriensis*, and in the upper jaw of *timoriensis* the distance between the anterior premolar and the canine is greater than in *vittatus*. Now every one is free to make speculations over the unknown origion of the Timor-pig, it is a fact that there at present is living a dwarf-pig in wild condition, distinct from the other Malayan pigs. We have in the collection 6 skulls procured and presented to our Museum by Dr. H. ten Kate from the Timor-island and labeled by him »tame pigs", besides two skulls more collected by him at Landoe, Roti, labeled »wild pigs"; none of these skulls is fullgrown; practically I cannot detect any difference between Dr. ten Kate's »tame" and »wild" pig-skulls mutually, and on the other hand the typical Timor-skulls present no difference with ten Kate's specimens; that is to say the skulls labeled as from »tame" pigs make the impression as if they belonged once to specimens of a somewhat larger size, as in skulls of the same age and size the distance between the parietalia behind (later crest) is a good deal greater than in our typical »wild" specimens. If I may be allowed to make a suggestion then here is a great motive to suppose that the »tame" specimens living in Timor in confinement are of springs of tamed individuals of the wild pigs living in Timor; the reverse is not very likely as we hardly can suppose that the indigenous should have brought over from abroad »small" pigs to keep in confinement, and even not that true tamed large-pigs introduced from abroad should have given rise to a »tame" dwarf-pig-race, that escaped and grew wild! Without making all sorts of conjectures relating the origin of *Sus timoriensis*, as a matter of fact it has certainly nothing in common with *Sus floresianus* or another known small Pig-species.

Dr. S. Müller, who with Dr. Macklot collected our specimens in Timor stated: »that very young specimens are "striped or banded like in the young *vittatus*, that however "the two principal colors are less sharply circumscribed "and feebler, so that the distribution of the colors is less "distinctly visible." This is quite correctly expressed, for in our rather young specimen there merely is a shadow of bands, in older specimens the fur makes a black impression observed at certain distance, although a nearer inspection learns that there are black and brownish red bristles rather irregularly planted. From between the eyes longer bristles are to be seen of a black colour running over the spine of the back and forming in the nape of the neck a kind of crest. Over the snout and on the cheeks and sides of lower jaw the bristles are yellow red; opening of lacrymal glands beset with reddisch brown hairs. According to Müller the lower part of the legs is somewhat lighter colored than the other parts; the same observer reported that the iris is light or yellowish brown and the nose sooty black.

8. *Sus celebensis* S. Müller.

The Celebes-pig, figured in »Verhandelingen" Tab. 28*bis*, fig. 1, drawn after the type-specimen, a very adult male, from Forsten's collections made in North-Celebes, is characterized by a distinct tuft of light colored bristles on the hindpart of each cheek; this tuft is to be seen in very young specimens as well as in very adult ones. In half-grown individuals there is like in *vittatus* a broad yellowish or brownish colored band on the snout, running like in that species over the sides of the head towards the lower parts of the neck; this band is sometimes more or less inconspicuous, but never wholly absent nay in adult specimens. In adult animals there is a small wart on each side of the snout just straight above the corner of the mouth, although less developed in females than in males. Between the ears there is a kind of black crest of elongated bristles, diminishing in length along the spine of the back. The young ones are adorned with very sharply traced broad bands of light and black brown colored bristles. These bands are by advanced age still to be seen under certain light and do vanish not so early as in the other banded species. By the banded snout, the banded young ones, the short ears and the bony parts, as will be demonstrated below, *celebensis* has much more in common with *vittatus* than with *verrucosus* as S. Müller and Schlegel suggested; herein I agree with Nehring and differ widely from Forsyth Major's opinion, who goes so far as to call the Celebes-pig, *Sus verrucosus celebensis*; we should like to ask why not just the reverse; *Sus celebensis verrucosus?* How does he know that *verrucosus* is the older form? This may be as it will, the fact is that our species nothing has at all to do with *verrucosus.*

The skull, figured in »Verhandelingen" Tab. 28*bis*, figs. 2 and 3, is short and compact like in *vittatus*, not so elongate as in *oi*, *barbatus* and *verrucosus*, and higher in proportion to its length. On each maxilla there is a single foramen infraorbitale like in *vittatus* and *barbatus.* The premaxilla-bones stop not close to the upper incisors like in *verrucosus*, but surpass their anterior border like in *barbatus* and *vittatus.* There are in our collection besides the typical very old male-skull, an old female-skull and a not adult male-skull all from Forsten's voyage in Celebes, of which in the very old male-skull the premaxilla protrudes beyond the anterior border of the incisors not less than 17 mm. This skull is an example of transformation by extremely advanced age, a phenomenon not thoroughly studied till now, although well known in Elephants, Foxes, Phalangers a. s. o.; in this Pig-skull nearly all the sutures have vanished so that it forms as it were a compact bony mass, with the upperparts very roughened and ploughed with ridges and grooves like in Crocodile-skulls. The molars are so very used, that the left lower ones are deformed to a number of stumps, that the upper premolars are not to be recognized as such, being a lot of mere stumps, that of the six incisors nothing has remained as four small stumps, that the anterior palatine foramina are mere oval shaped openings in a bony mass, a. s. o. In the two other mentioned skulls the premaxilla protrudes 6 mm. The female-skull too has all the molars very used and the hindmost incisors have disappeared; the bony palate is in the middle as it were deeply hollowed; nasalia roughened as a feeble imitation of these bones in the male-skull. Very striking in *celebensis* is the small size of the molars in general and specially of the hindmost upper and lower molars; in the very adult male-skull, without about any trace of sutures, having nearly all the molars worn out and very used, the last upper molar measures 24 × 15 mm. and the last lower molar 25 × 15 mm. (cf. measurements of adult skulls of *vittatus*). The skull has not an elegant shape, but it has more the broad form of *verrucosus*, especially in the very adult male-skull. Profile-line always somewhat concave, in adult skulls rather deeply concave on the nasal bones. No skull nay the extremely adult male-skull above mentioned shows any tendency to form a crista, the smallest distance between the parietalia above being still 31 mm., in the adult female-skull from Forsten's collections the distance is 19 mm. Although as I pointed out the male- as well as the female-skull both belong to very adult specimens, they however present a very remarkable difference in size, the male-skull is a good deal longer than the female one, the difference being here much greater than in the other species:

	♂ ad.	♀ ad.
greatest length	307 mm.	258 mm.
greatest width	135 »	111 »
length of bony palate. . .	190 »	158 »

The younger male-skull presents the measurements of the adult female-skull, the differences may be called imperceptible.

The here discussed adult male-skull is the very specimen figured in the »Verhandelingen"; it is a very accurate reproduction, however the artist made a cardinal mistake! He namely replaced the — as I said above — worn-out or absent molars by other ones, in order perhaps to furnish a more complete and nicer looking drawing; that the artist drew non-existing molars may be demonstrated by the fact that he figured *eight* lower molars instead of *seven* — and we never possessed a skull with eight molars! Professor Rolleston [1]) and Nehring [2]) have fixed the attention upon this curious phenomenon — although they could by no means suggest that it really was a mistake by the artist and not an abnormity.

Figure 2 on plate 10 will give a fair impression of the underside of this old male-skull.

As I remarked Forsten's specimens were procured from North-Celebes (Menado); other individuals from North-Celebes are in our Museum, they have been collected by von Rosenberg in 1864 at Toelabollo, Gorontala.

There is however in our collection a skull of a full-grown specimen, collected by Bernstein in South-Celebes; this skull does not agree with the above described true *celebensis*-skulls; other skulls, adults and young ones, collected by Prof. M. Weber in South-Celebes, Bira, Kadjang, Loka and Pare-Pare, differ as much from the true *celebensis* from North-Celebes; it is a pity that all these South-Celebian skulls are without skins! — Is perhaps this animal an other species? Now it is highly interesting to remember that Prof. Nehring (ueber *Sus celebensis* und Verwandte, p. 27) wrote: »wichtig wäre es, wenn zukünftige Forscher "und Forschungsreisende ihr Augenmerk auf folgende Punkte "richten wollten: . . . 4. Lassen sich constante Unter-"scheide zwischen den aus der Minahassa und aus den aus "Süd-Celebes stammenden Exemplaren des *Sus celebensis* "beobachten?" That sharp-sighted investigator had as it were a presentiment that the southern Pig should specifically differ from the northern species. Therefore it may be called a mere unfortunate chance that Prof. Nehring did not observe that by figuring side by side on Taf. I a male from South-Celebes together with a female from Minahassa, North-Celebes, he saw not that he had reproduced the skulls of specimens belonging to two distinct species! — For the skull of the male from Saleyer-island, South-Celebes (fig. 1) is much larger than a typical *celebensis*-skull, and besides other differences it above all lacks a very important and striking characteristic, namely, the prolonged intermaxilla beyond the anterior border of the upper incisors, — this characteristic is so exceedingly clear reproduced in the female-skull (fig. 2) from North-Celebes, a skull of the true *celebensis*. By the way I see from Nehrings drawings of Pigs from the Philippines — I personally never saw a skin or a skull from these islands — (Taf. I, figs. 3, 3*a*, 3*b* and 4) that the Philippine-skulls do share this characteristic with the North-Celebes-skulls. I propose to call the South-Celebian species after the so meritorious author of so many Pig-studies

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[1]) »On the Domestic Pig of Prehistoric times in Britain" (Trans. Linn. Soc. 1876, p. 260).

[2]) »Ueber *Sus celebensis* und Verwandte", p. 13.

9. *Sus Nehringii* [1]) n. sp.

As I remarked we possess no skins from South-Celebes; the bony parts at my disposal are:

1. Skull of a fullgrown female, South-Celebes, collected by Dr. Beinstein, 1866 (*d* of my Catalogue ostéologique, by a mistake registered as »semi-adulte)."
2. Skull of a just fullgrown female, from South-Celebes, Loka, near Bonthain, collected by Prof. Max Weber, 1888.
3. Skull of a young female, South-Celebes, Kadjang, Weber.

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1) Writing down these lines I hear that in the Journals is announced the lamented death of my friend Dr A. Nehring! We are convinced that his name never will be forgotten by working Mammalogists! He may rest in pace! 17 October 1904.

4. Skull of an adult male, from South-Celebes, Pare-Pare, collected by Weber, 1888. Without lower jaw.
5, 6. Skulls of a fullgrown male and ditto female, South-Celebes, Doodengrot (death's grot) near Bira, collected by Weber, 1888. The male-skull without lower jaw.
7. Skull of an adult male, Saleyer-island, from Weber's collections, 1889.

The skull of the Saleyer-iland agrees in shape, size and measurements very exactly with the skull figured and measured by Dr. A. Nehring in his paper »ueber *Sus celebensis* und Verwandte"; I mean with skull 1538, Dresden Museum, too from Saleyer, figured Abhand. Museum, Dresden, 1888/89, Taf. I, fig. 1 and Taf. II, figs. 2 and 8; they both are adult male-skulls. In comparing this Saleyer-skull with the two adult male-skulls from Pare-Pare and Bira and also with Bernstein's South-Celebian female-skull we state the very interesting fact, that although the named skulls do not perceptibly differ in size, the upper molar-series taken as a whole is much larger in the South-Celebian skulls, especially the three hind-most molars are much smaller in the Saleyer-skull: in mm.

	Saleyer.	*Pare-Pare.*	*Bira.*	*Bernstein.*
upper molar series	93	96	95	103.5
the three upper true molars	54	57.5	58	62

In the Saleyer-specimen from the Dresden Museum these measurements are 89 and 52, therefore still smaller than in our specimen. Is perhaps the Saleyer-island animal a smaller form of the South-Celebian species? The material is too incomplete to discuss this interesting point! We have now to describe this skull of the Saleyer, an old male-skull with its lower jaw. For the present I think it wise to give only previously another specific title to the Saleyer-Pig; if it lateron appears that there exists truly a specific difference between the Pigs of South-Celebes and those of the Saleyer then the Saleyer-species once for all may be *Sus Weberi.*

The skull of the Saleyer seen from above shows not the elegant shape of *barbatus* and as much not that of *verrucosus* but more an intermediate stage. The animal must be a very strong build one, for the skull although not large is very broad and thick-bony; in this male-skull the osseous crest above the alveolus of the upper canine is relatively as well as absolutely much stouter developed and more thickened behind than in the larger species; the canines are strong and very curved. Although the molars are feebly used and therefore the skull not very adult, the distance between the parietalia (later crista) is only 20 mm. The profile-line of this fullgrown skull is feebly concavely curved, frontalia and nasalia very rough. Bony palate much more protruded beyond the hind-most molar than in *celebensis*. Side of the lower jaw in the middle somewhat swollen.

There is a hypothesis generally accepted by Zoologists that there have been land-connections between the large Islands of the western part of the East Indian Archipelago and the Indian continent; they want such land-bridges to explicate the fauna of these Islands. This hypothesis may be based upon geological grounds, it however is a fact that a lot of animals now living in these islands have no representatives on the Indian continent, f. i. what *Paradoxurus*-species, what *Anoa*-species, what *Babirussa*-species have walked over the land-bridge to Celebes? *Paradoxurus Musschenbroekii*, *Anoa depressicornis* and *Babirussa alfurus* have at present no representatives on the continent! The defenders of the land-bridge-hypothesis however will tell me that in the darkness of past geological ages a *Paradoxurus*, an *Anoa*-like animal, a Pig walked over the temporary bridge; that these animals lived for centuries isolated on Celebes and have given rise to offsprings quite different from the original forms, — developed by the stuggle for life and existence? Not very likely, as there are on Celebes nor have existed in foregoing ages, as far as we know, large *Paradoxurus*-, or *Anoa*-, or *Pig*-eating mammals or other carnivorous animals! And as the named mammals never had large enemies, the more it must excite surprise that Celebes is at present not crowded with large herds of *Paradoxurus-*, *Anoa-* and *Babirussa*-individuals, but that contrariwise the numbers of individuals of the named genera are very restrict, nay rare! This leaving as it is, it is believed that the presently on the large East Indian Islands living Pigs are offsprings from intruders from the Indian Continent, turned 1) into quite distinct forms during past thousands of years, and they reason further as follows: as there was formerly no land-connection between the Indian Continent and New-Guinea, the presently in New-Guinea living Pigs ought to be offsprings of imported tame Pigs grown wild! However no more as anybody can tell us from which species have originated the other Pigs from the large East-Indian-Islands, which ancestors walked over land-bridges or other land-connections from the continent, no more anybody can say from what species of Pigs the in New-Guinea now living Pigs are offsprings, — and they differ from all other known forms! But consented that the ancestors of the New-Guinea Pigs have been brought over by mankind or by an other unknown agency, they as a matter of fact presently differ as much from their unknown ancestors as the Pigs of the large East-Indian-Islands presently differ from their unknown ancestors, and there is no reason to distinguish the latter by specific names and those from

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1) f.i. Stehlin (Ueber die Geschichte des Suiden-Gebisses, 1899, Erster Teil, p. 292) suggests: „Babirussa könnte ein modificierter *Paloeochoerus* von *verrucosus*-Typus sein, d. h. *etwa seit Beginn des Miocaens seine eigenen Wege* “*eingeschlagen haben*. Das dabei geographische Isolierung eine Rolle spielte, “halte ich für sehr wahrscheinlich.” And Wallace (the Malay Archipelago, 1869, Vol. I, p. 435) explained the as useless supposed curved upper canines as follows: „I should be inclined to believe, that these tusks were once useful ,“and were then worn down as fast as they grew; but that changed conditions ‘of life have rendered them unnecessary, and they now develop into a monstrous form.” And there never have been Pig-eating animals in Celebes, therefore may one ask after the „for what” these teeth „once” have been „useful”? and „are they now truly useless”? Nescimus!

New-Guinea not! Therefore I cannot accept Dr. C. Keller's »Urteil", viz:" »*Sus papuensis* und *Sus niger* von der Liste zu streichen" [1]. I subscribe Nehring's opinion: »manche "Autoren nemen an, dass die wildlebenden Papua-Schweine "auf Neu-Guinea nicht ursprünglich einheimisch, sondern "die nachkommen verwilderter Hausschweine seien. Diese "Frage ist heute noch nicht Spruchreif; sie könnte mit "Sicherheit wohl nur durch Auffindung fossiler und sub-"fossiler Sus-Reste auf genannter Insel entschieden werden." (Die Rassen des Schweines, Erster Abschnitt, p. 12).

10. *Sus papuensis* Lesson.

Much better than Lesson's figure of this Pig is that given by Nehring in »die Rassen des Schweines", drawn after a nearly adult female-specimen brought over in 1885 by Dr. Finsch from Neu-Guinea to the Berlin Zoological Garden and described by him in his »Samoa-fahrten." The best description of the species may be that of a semi-adult Waaigeou-specimen given by me in the Notes from the Leyden Museum, 1891, p. 99, after Bernstein's Manuscript, so that externally the nearly adult, semi-adult and young animal is sufficiently characterised. Two Morotai-specimens from Dr. Bernstein's collections represent the animal in fullgrown and very old condition. The bristles grow darker and are black in very old age, constantly however with the exception of the streaks on sides of cheeks and spot under the eyes, which are dirty white to yellowish red. The adult animal (dried skins!) has the enormous size of at least 950 mm., Bernstein's semi-adult measured 575 mm. and Finsch's nearly adult 1020 mm.! The skull of *papuensis* — as far as I am aware — never has been described in details. The skull of a very adult specimen — appearantly a male — belonging to a skin from Morotai, collected by Dr. Bernstein, shows the following characteristics:

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[1] Dr. C. Keller. Naturgeschichte der Haustiere, 1905 (I write this Nov. 3. 1904), p. 228.

as to the general shape it belongs to the non-elegant *verrucosus*-typus, but herewith stops the conformity with that species; it is of a still smaller size than *celebensis*, having a profile-line of 295 mm. and the parietals approach behind at a distance of 20 mm.; the profile-line is concave at the base of the nasalia, the latter bones for the rest broad and straight; eye-holes surprisingly large; bony palate ends behind the last molars for not more than 9 mm.; size and shape of these hind-most molars may be studied from Plate 13, they all are very used; in each ramus of the underjaw only *six* molars are to be seen, however not as a proof of advanced age, although there is no trace of adveole. It is very remarkable that in an other skull — half grown as the hind-most molar still is absent — from Batjan [1]) there also the anterior premolars are wanting without a trace of adveole and in a still younger skull — the two hind-most molars are not yet developed — the very anterior lower premolars are absent without a trace of alveole; I confine myself at present by stating this as a bare fact without any comment, it however is too obvious to give room to a mere casuality, I think, for as a rule the anterior lower premolar in other Pig-species is always to be seen in very young specimens, generally is persistent in elder individuals and only falls out in very old ones, although even then exceptionally.

The very young specimens are very conspicuously striped or banded, reddish brown and black, as our two specimens from Morotai and the Batjan-specimen may demonstrate.

Our specimens are from Batjan, Morotai, Waaigeou and Arou-islands, Wokam.

11. *Sus niger* Finsch.

The skull of a *niger*-specimen never before has been

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1) A skull without skin, collected in Batjan by Dr. Bernstein and, like a very young specimen from Batjan by the same collector, probably belonging to *Sus papuensis*.

figured; therefore it is a great pity that the skull in our collection (see plate 14) is that of a young or half grown — the hind-most molar in both jaws are still in their alveoles — individual, taken from a female — now stuffed — collected by von Rosenberg on the Goram-island; the posterior part of the skull is wanting and the bony palate has been smashed. However, as something always is better than nothing, I will describe this, although incomplete, however unique skull. I compare it with the skull of our Batjan-*papuensis* because both skulls are of the same stage of development of the molars. Although the general shape may be found to agree, the *papuensis*-skull is a good deal larger, the six — the hind-most is not yet developed — upper molars taken together measure 83 mm. in the young *papuensis* and 75 mm. in our *niger*; five lower ones — the hind-most still absent — 75 mm. in *papuensis* and 72 mm. in *niger*. The muzzle of *niger* is not so elongated as that part in the young *papuensis*, length of nasalia of *niger* 110 mm., of *papuensis* 128 mm., the frontal bones in *niger* are shorter so that the skull makes a more or less compact impression than in *papuensis;* intermaxillaria much less produced in *niger;* the orbits in *niger* on the other hand are much more developed; the coronoid process in *niger* is less developed but much more pointed than in *papuensis;* and so there are a lot of differences sometimes insignificant in itself but all taken together enough characteristic for specific distinction. In the left ramus of the underjaw in my *niger*-skull there is no trace of anterior premolar, although the named tooth is so well represented in the right ramus — in *papuensis* the anterior premolar is generally absent as I pointed out before.

As to the black color of adult and very young specimens I refer to what I broadly said in the Notes from the Leyden Museum, 1891, pp. 102 and 103. A few words concerning the ending of the tail. In our very young specimen (from Ternate) of about 32 cm. from base of tail to tip of snout, the hairs of the sides of the distant half of the tail are elongated and elegantly curved towards and over the tip of the tail, so that the total impression is that of a lyre; in an older specimen (from Goram), measuring 88 cm., these hairs are still more elongated, but the flat tail ends in the same lyre-shaped figure; in a still older specimen (from Tidore), measuring 106 cm., the elongated hairs have been weared off so that the tail ends in a flattened strong brush, along the sides the hairs are diminishing in length.

A few words concerning the ear of *niger* compared with a *papuensis*-ear: as far as can been studied from dried skins it makes the impression as if the ear of *papuensis* has in all ages a more or less oval shape, meanwhile in *niger* the lower half of the outer margin of the ear describes a broad circular line; moreover the ear of *niger* is larger than in *papuensis*.

In our collection are skins from Tidore, Ternate, Goram, and Waaigeou.

Conclusion.

The different islands of the East Indian Archipelago are inhabited by the following species:

Sumatra — *Sus vittatus* and *oi.*
Borneo — *Sus barbatus.*
Java — *Sus verrucosus* and *Milleri.*
Celebes (North) — *Sus celebensis.*
Celebes (South) – *Sus Nehringii.*
Saleyer — perhaps a distinct species, *S. Weberi.*
Timor – *S. timoriensis.*
Flores — *S. floresianus.*
New Guinea with adjacent islands — *S. papuensis* and *S. niger.*

Pulo Laut, North Natuna islands — *S. natunensis*, described in 1901 by Mr. G. Miller Jr. I never saw a specimen of these islands however.

Amboina — *S. amboinensis* Major; Ceram — *S. ceramicus* Gray; and Borneo — *S. borneensis* Major are absolutely unknown animals to me, so that I have no opinion at all as to their specific value.

	S. barbatus.					Sus oi.				S. verrucosus.			S. vittatus.					S. Milleri.			S. floresianus.			S. celebensis.		S. Nehringii.					Sus papuensis.	
	a.	b.	c.							a.	d.	e.	c.	h.	i.	l.								a.	b.							
	♀ ad. 3).	♂ ad. 3).	♂ ad. 4).	♂ ad. 5).	♂ ad. 6).	young 7).	young).	young 8).	♂ ad. 10).	ad.	ad.	very ad.	♂ ad.	ad.	ad.	ad. 13)	♂ ad. 14).	ad. 15).	ad. 16).	ad. 17).	♂ ad.	♂ ad.	♀ ad.	♂ ad.	♂ ad.	♀ ad. 18).	Loka. ♀.	Pare. ♂ ad.	Bira. ♂.	Bira. ♀.	♀ ad. 19).	♂ ad. 20).
Greatest length of skull	426	404	440	453	488		294	262	480	367	395		375	346	332	332	372	330	339	315	265	257	269	307	255	284		339		267	258	295
Basilar „ „ „	376	367	393		410	298	254	230	410	312	345		327	298		279	325	292	285	273		229	237	257		263	232	273	257	233	216	262
Greatest breadth „ „	141	138	159	170	172	118	102	102	162	150	165	173	150	141	142	137	146	146	146	125	133	124	130	135		127	121			114	111	139
Length of nasals	219	211	225	237	245		134		240	184	200		185	165	156	153	183	156		151	142	128	135		123	129		165		136	128	151
Breath of nasals	37	31	32	36	31		28	27	38	33	34	31	33	36	34	31	34	39	39	29	37	34	36		28	34	30	34	33	25	30	31
Palatal length	297	285	312	320	329	230	189	171	330	230	256	255	232	208	209	193	228	212	200	192	172	163	165	190	161	186	166	195	189	168	158	187
Width of palate at molars 1	29	34	31	36	32	24	22	19		29	32	35	28	30	27	33	32	28	33	26	34		30		24	30	27	29	29	25	23	33
Length upper molar series 1).	114	118	115	115	119					113	116	108	115	107	100		112	110	101		89					96	85	89	89	83	86	86
Length lower molar series 1).	121	124	128	126	125					113	122 12)	113	119	113	115		117	118	105		91			85		99	89			85	90	94
Length upper molar 3	35	35	38	38	38					+	42	30	38	31	31		33	34	30	+	26		+	24	+	26	26	26	26	24	26	26
Length lower molar 3	36	36	40	42	41					+	46	36	40	34	34		37	38	35	+	30		+	25	+	31	27			25	28	32
Lower jaw, condyle to incisor-alveole 2).	320	312	345	348	355	251	215	191		275	295	305	279	261	250	245	285	259	255	235	220	204	209	230	195	222	202			200	186	230
Lower jaw, coronoid to base	115	120	135	127	128	100	81	81		117	137	133	134	127	117	116	137	123	125	107	101		101	102	94	106	95			89	90	111

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1) without anterior premolar.
2) i. e. to the margin of the alveole of central incisors.
3) hindmost molar not used.
4) hindmost molar very used; anterior premolars pushed away.
5) *Sus verrucosus b* of the Catalogue ostéologique; all teeth very used; condylus occipitalis cut away.
6) *Sus verrucosus c* of the Catalogue ostéologique; all teeth very used; hindmost upper premolar the only in loco.
7) hindmost molar not yet developed; nasalia smashed.
8) five teeth in each jaw.
9) five teeth in each jaw, the fifth partly developed.
10) Miller's typical specimen.

+) not wholly developed.
12) length of right row; in the left row there are in the alveole for the reception of the third premolar three normally developed teeth, therefore the whole row is larger.
13) hindmost molars partly developed.
14) one of Prof. Max Weber's specimens from Fort de Kock, Sumatra.
15) *Sus vittatus a* of the Catalogue ostéologique.
16) *Sus vittatus j* of the Catalogue ostéologique.
17) *Sus vittatus k* of the Catalogue ostéologique.
18) *Sus celebensis d* of the Catalogue ostéologique.
19) *Sus celebensis f* of the Catalogue ostéologique.
20) *Sus celebensis e* of the Catalogue ostéologique.

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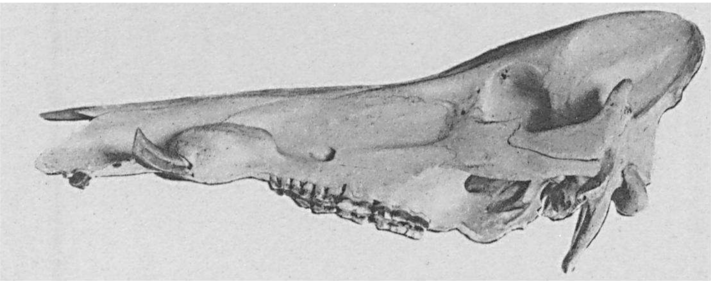

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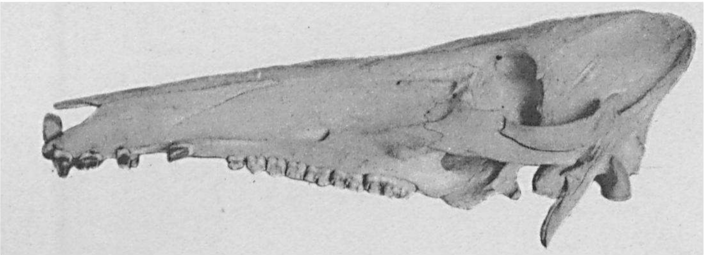

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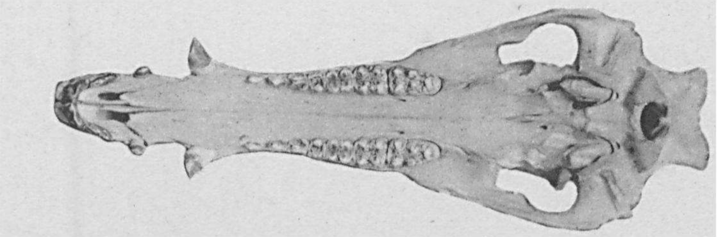
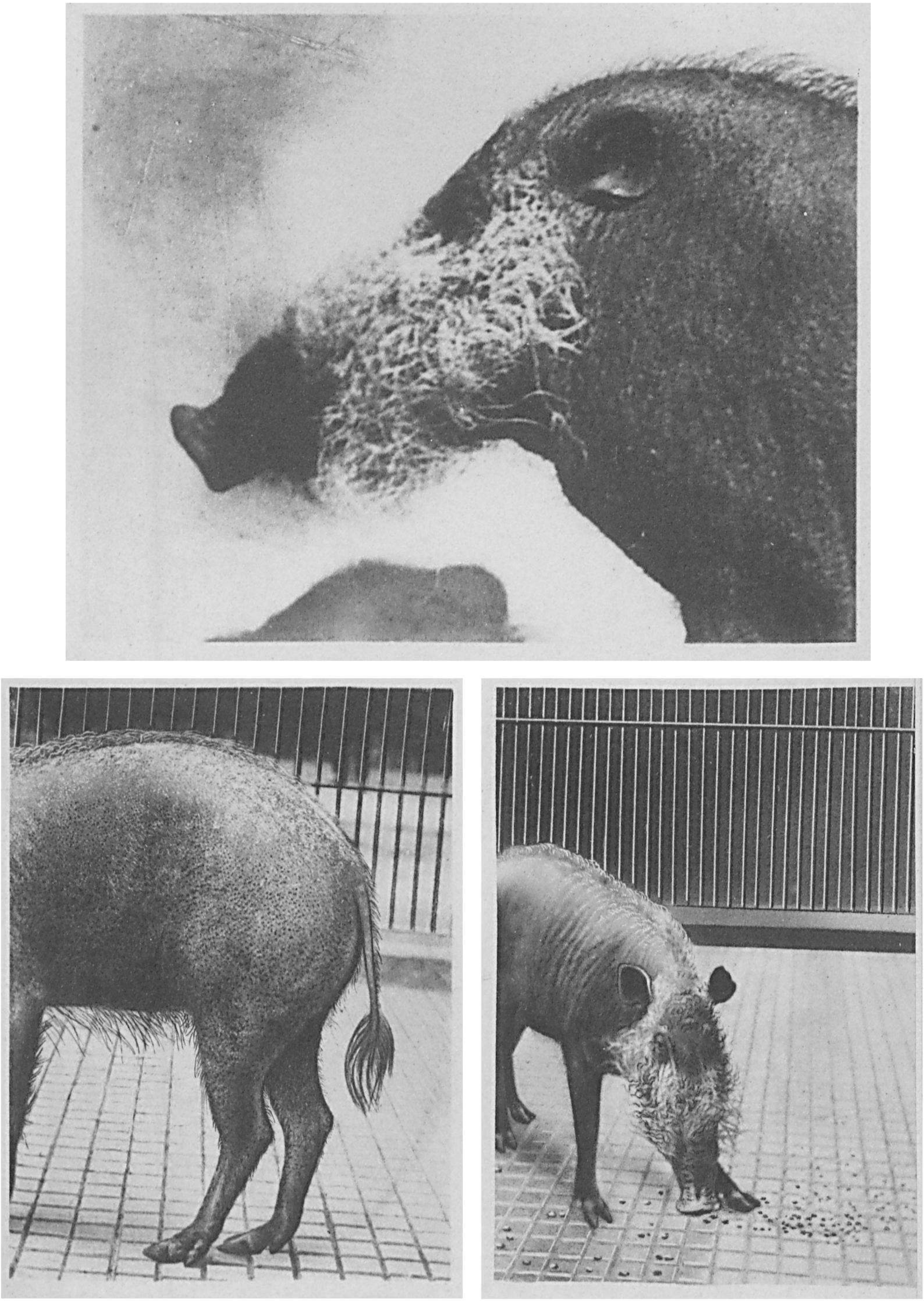


WÄKERLIN AD NAT. PHOT.

L. VAN LEER & Cº AMSTERDAM.

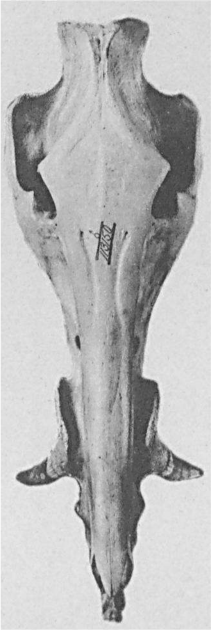
SUS BARBATUS S. Müller.

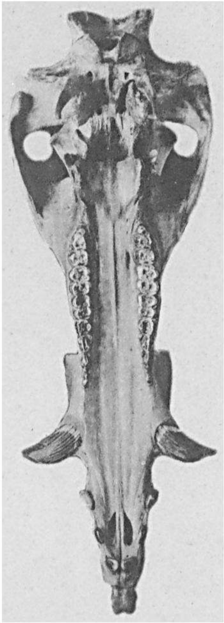


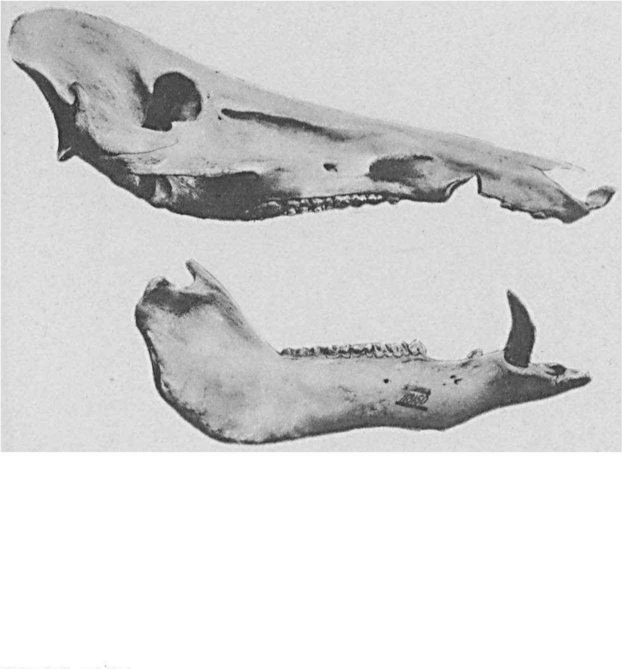
WÄKERLIN ET V. ZANDEN AD VIV. PHOT.
L. VAN LEER & Cº AMSTERDA

SUS OI Miller.

PLATE 4.





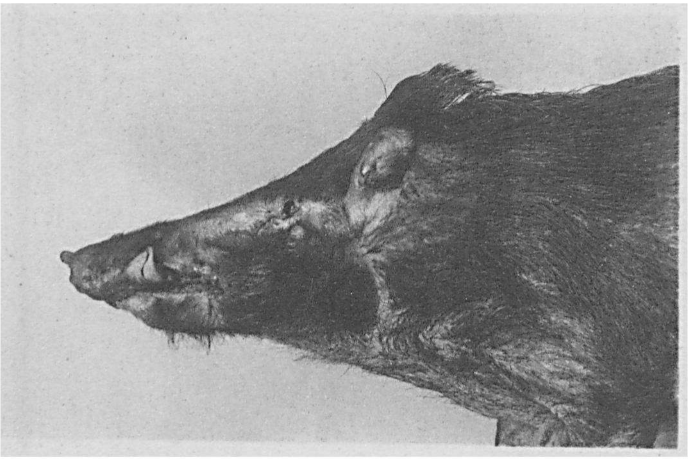


WÄKERLIN AD PHOT. TYP. PHOT.

L. VAN LEER & Co AMSTERDAM.

SUS OI Miller.

3.



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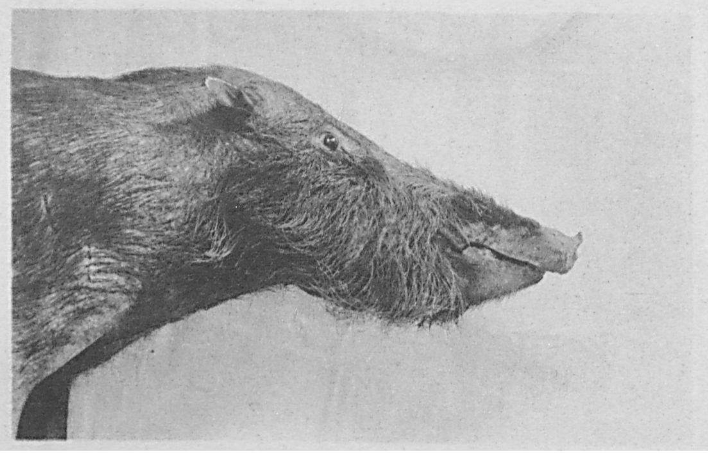

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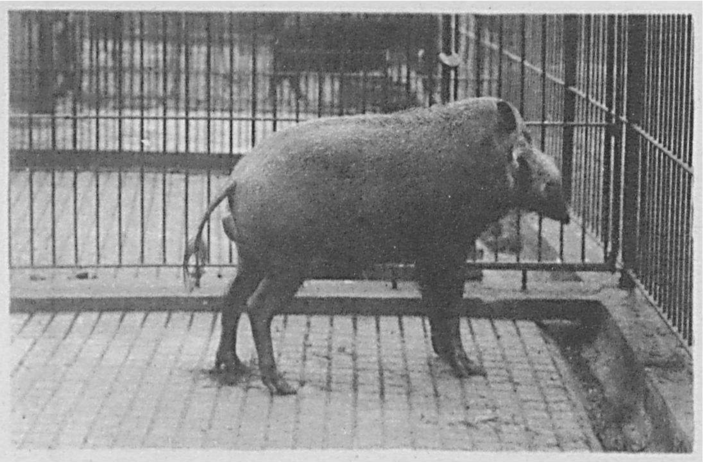
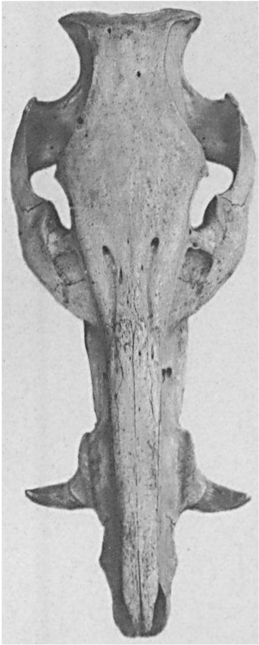


WÄKERLIN AD VIV PHOT.

L. VAN LEER & Co AMSTERDAM.

Fig. 1. SUS OI Miller.
„ 2. SUS BARBATUS S. Müller.
„ 3. SUS VERRUCOSUS S. Müller.

2.



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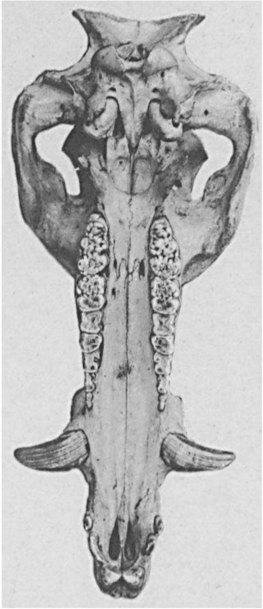

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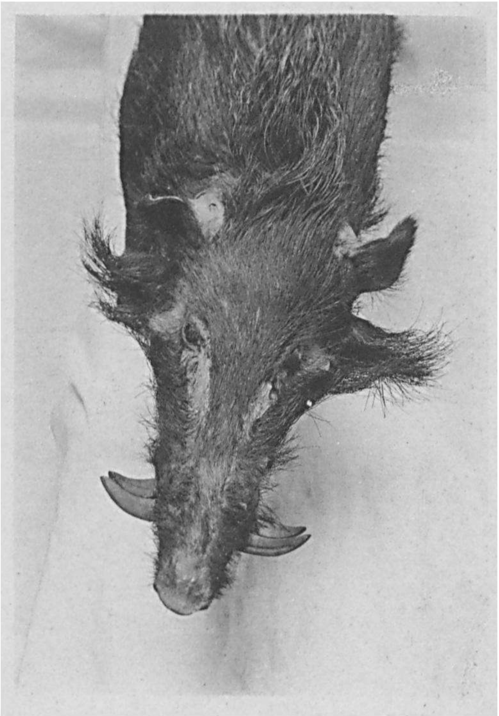

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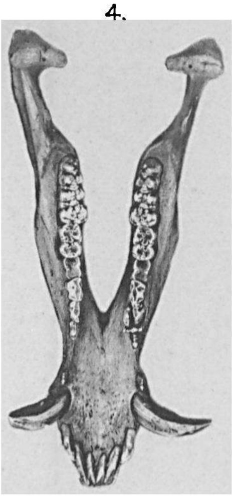
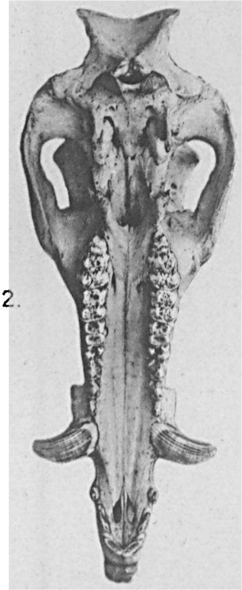


WÄKERLIN AD NAT. PHOT.

L. VAN LEER & Co AMSTERDAM.

SUS VERRUCOSUS S. Müller.



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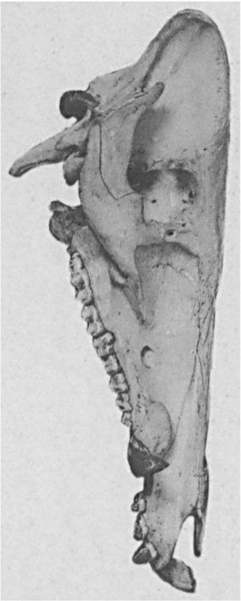

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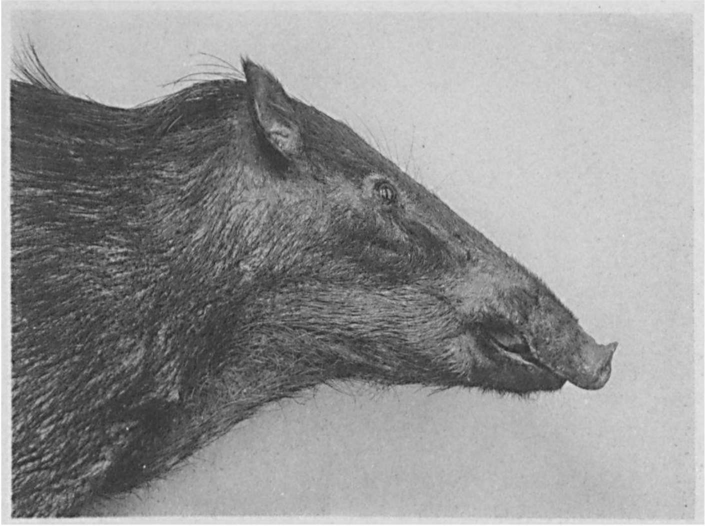

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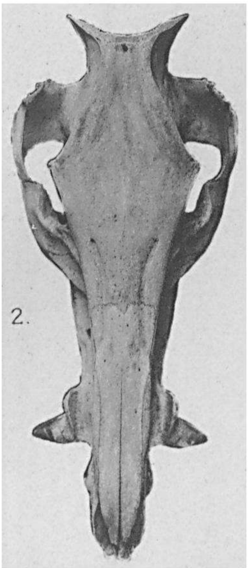
SUS VITTATUS S. Müller.



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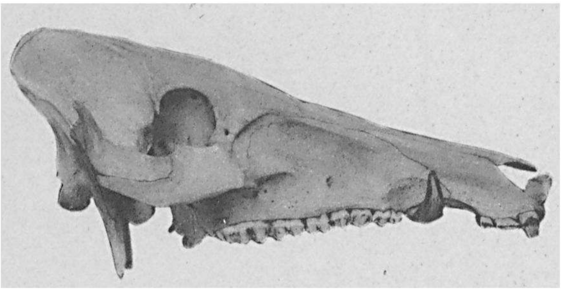

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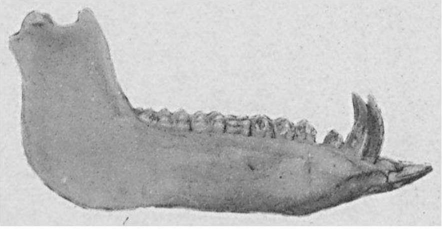

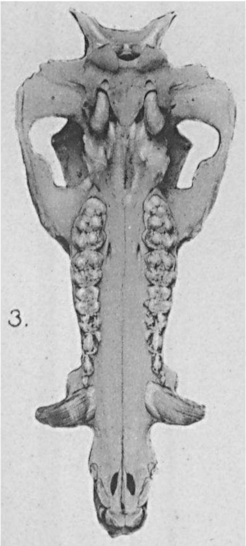

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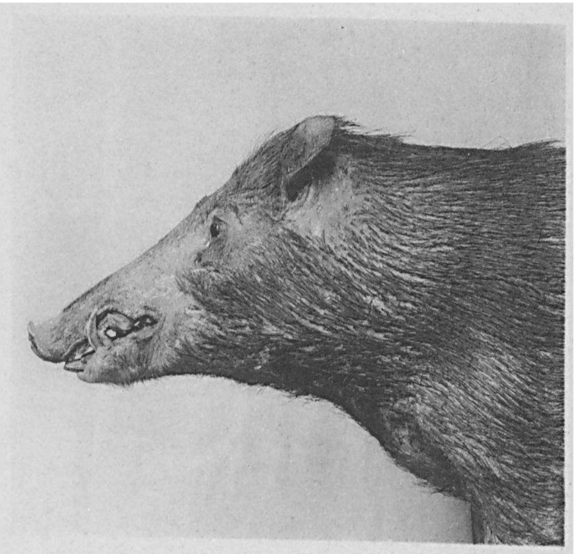

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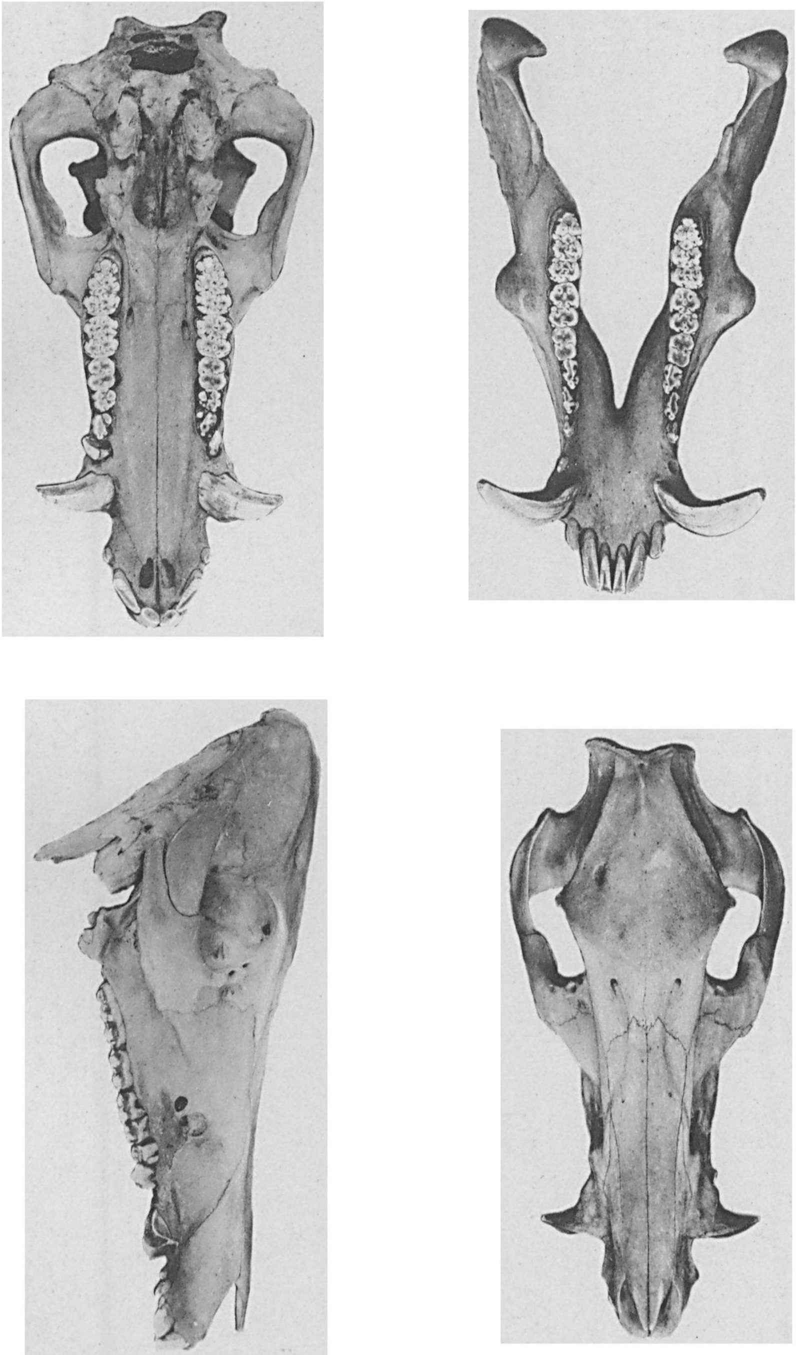
SUS MILLERI Jentink.



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L. VAN LEER & Co AMSTERDAM.

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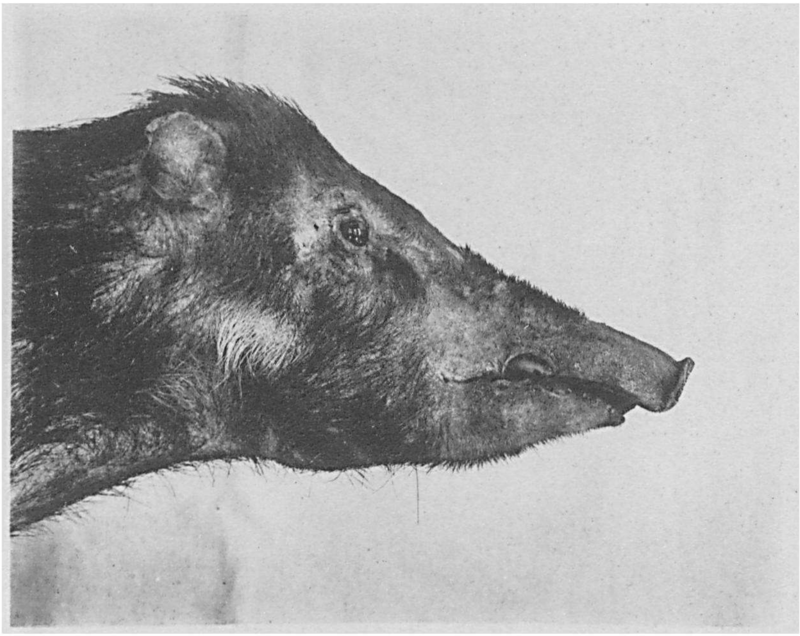

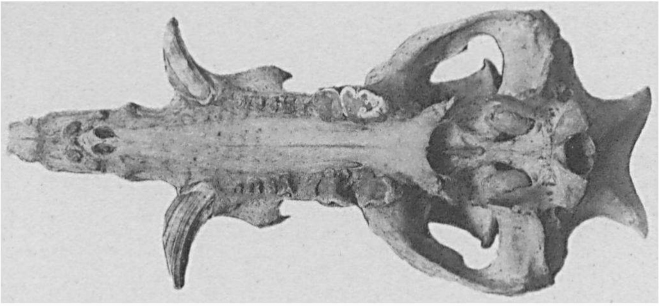

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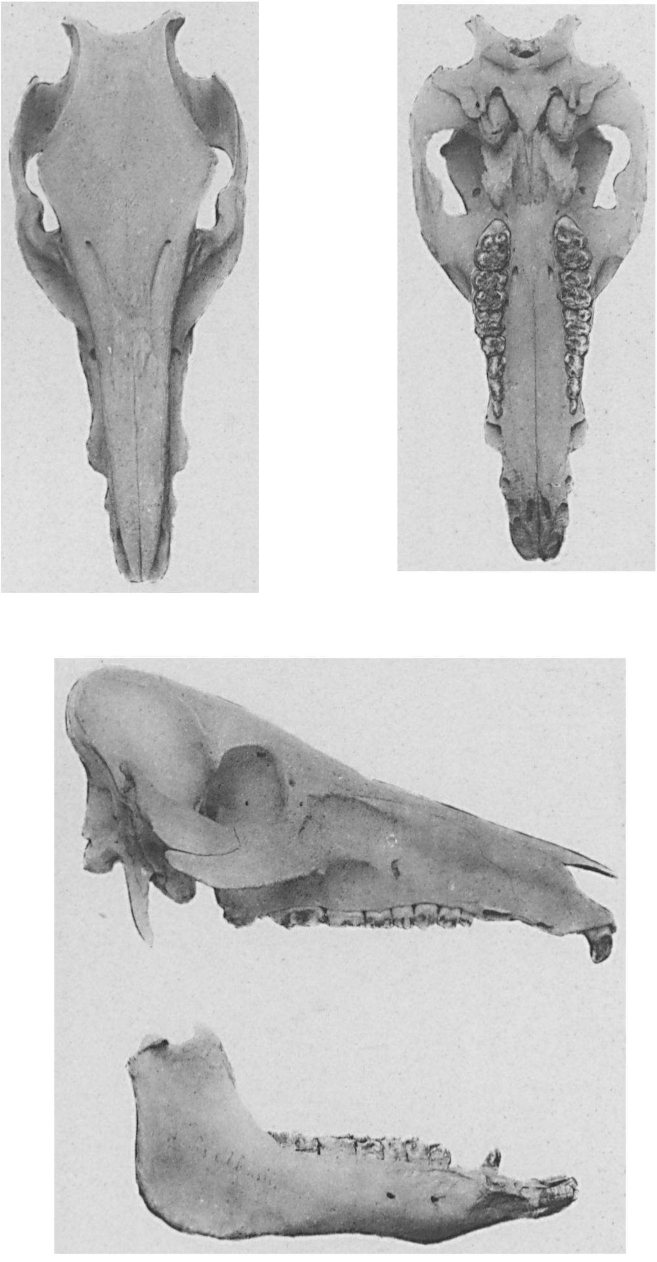
L. VAN LEER & Co AMSTERDAM.

SUS CELEBENSIS S. Müller.



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L. VAN LEER & Co AMSTERDAM.

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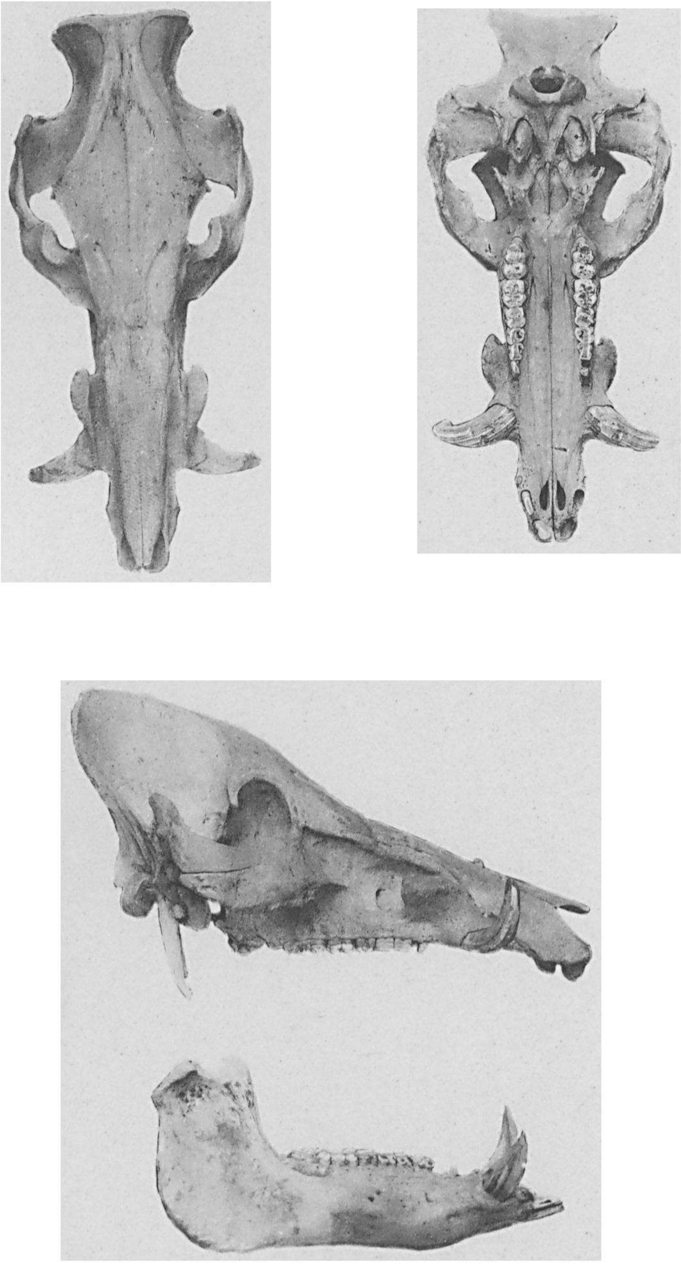

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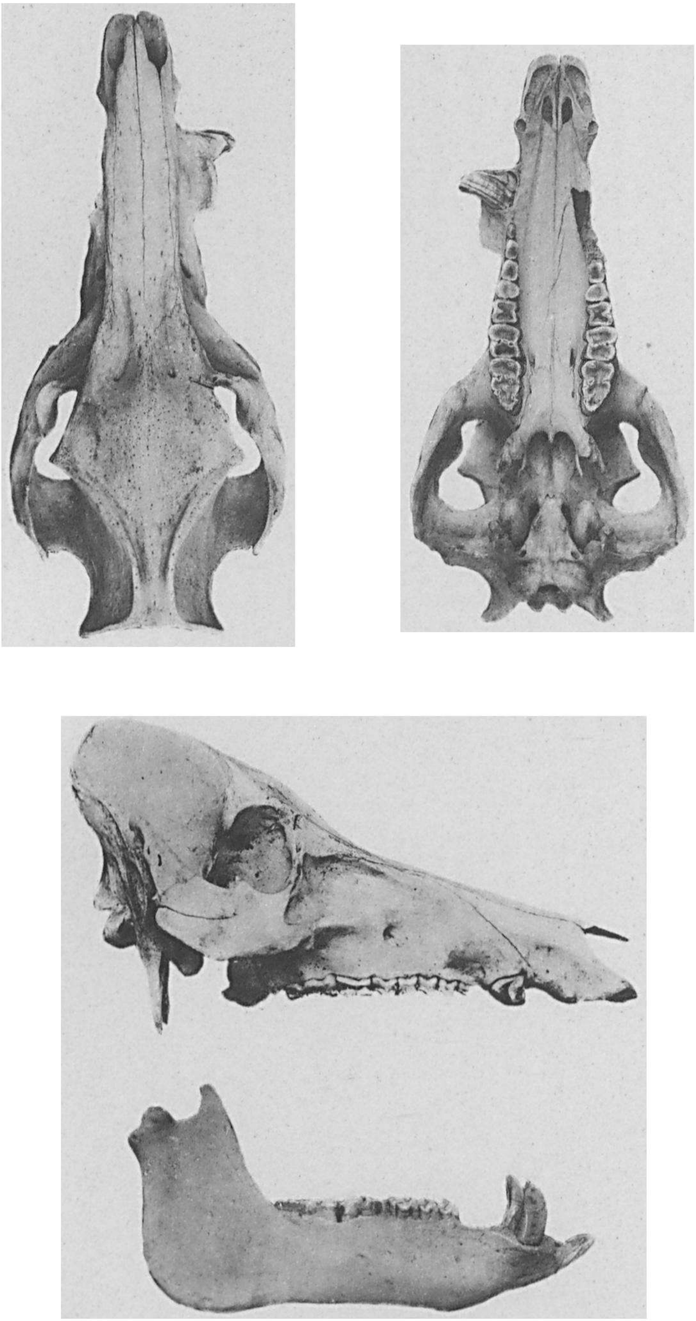

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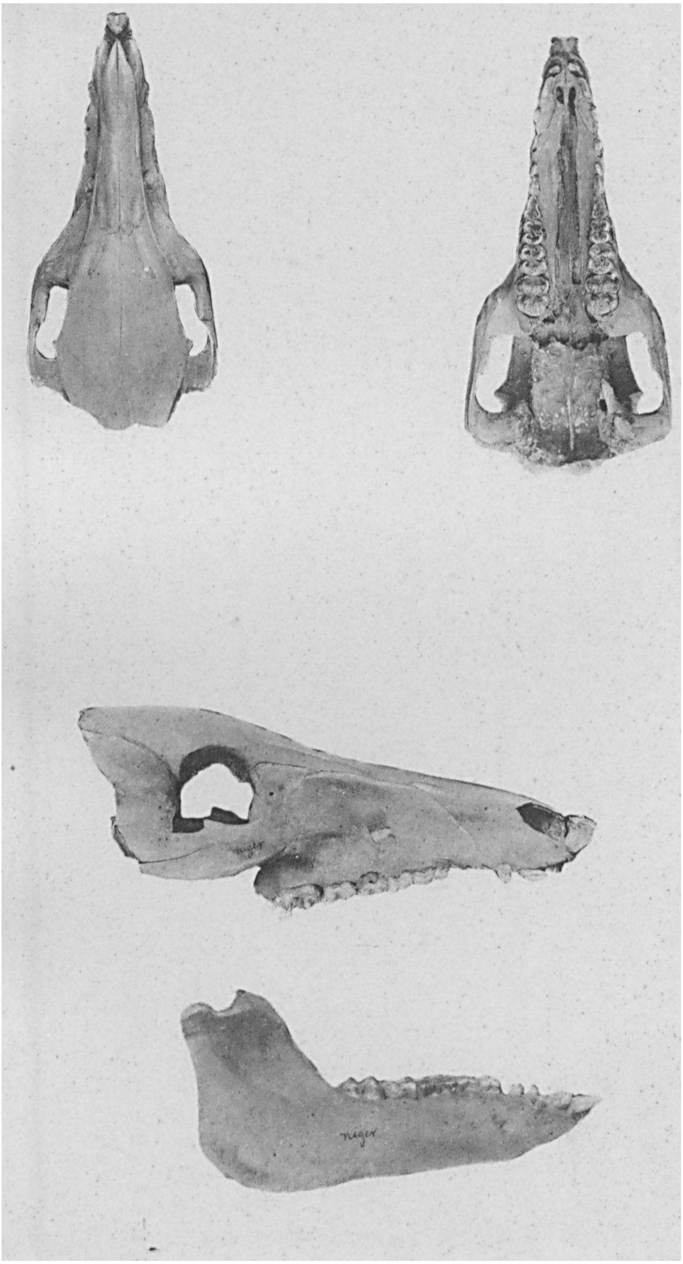
L. VAN LEER & Co AMSTERDAM.

SUS PAPUENSIS Lesson.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SUS NIGER Finsch.